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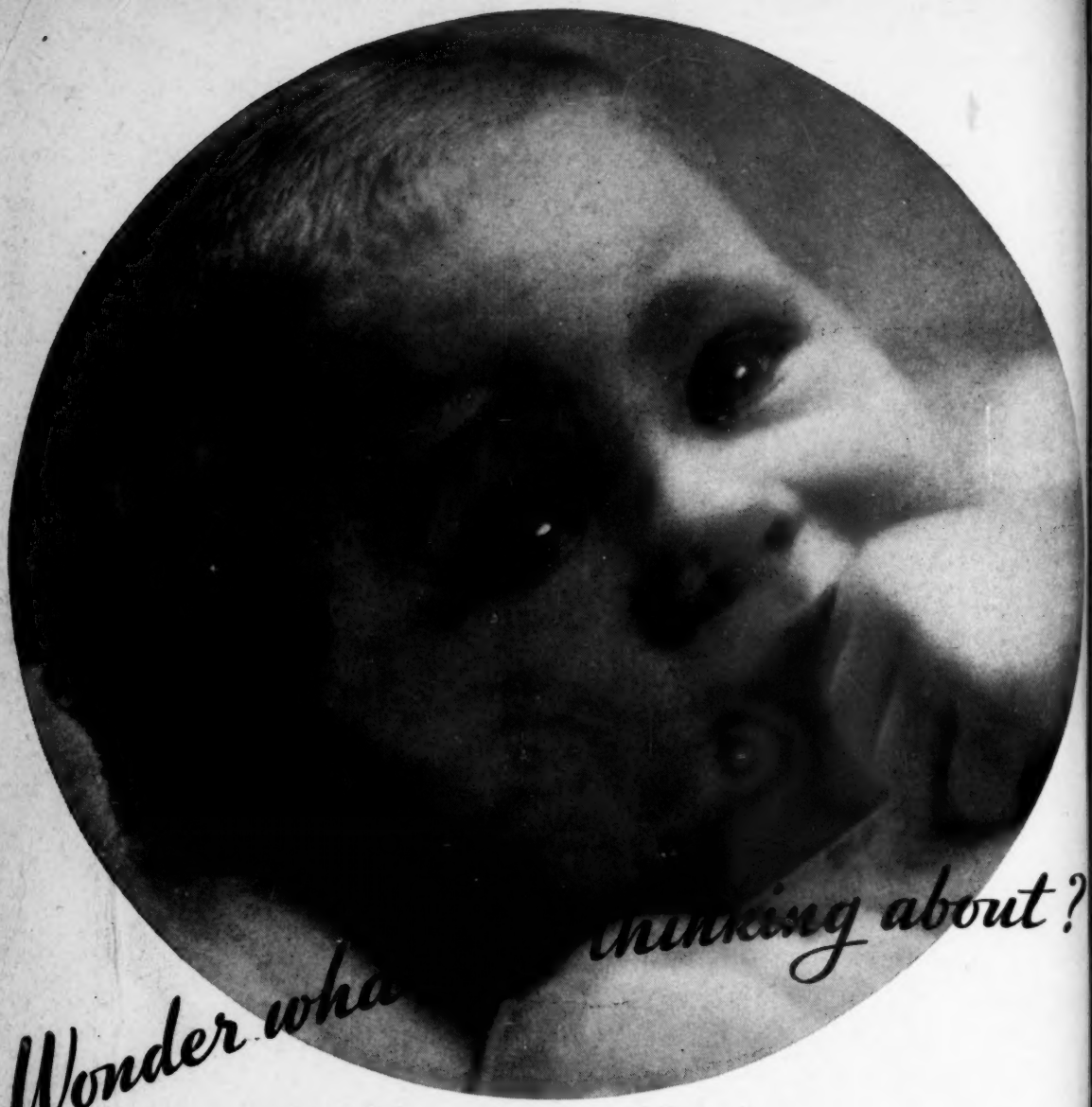

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AMERICAN JOURNAL OF OPHTHALMOLOGY

VOLUME 18 APRIL, 1935 NUMBER 4

INTENSITY OF LIGHT IN RELATION TO THE NEAR POINT AND THE APPARENT RANGE OF ACCOMMODATION

C. E. FERREE, PH.D., AND GERTRUDE RAND, PH.D.

The effect of increase of intensity of light on the near point of vision and apparent range of accommodation is shown. In general an increase of intensity of light greatly improves vision at any distance. As an aspect of its improvement of near vision it causes a substantial approach of the near point to the eye, which is especially marked in case of old eyes. This ability to see at closer range is of great importance in presbyopia, particularly in its early stages. As presbyopia approaches, higher intensities of light can be used successfully to defer the use of reading glasses in many cases when the failure of accommodation is slow, and in the earlier stages of presbyopia to lessen the need of frequent changes in the strength of the glasses. In all cases unless there is some special contra-indication the powers of vision are greatly improved by an increase of intensity of light to keep pace with the failing powers of the eye. From the Research Laboratory of Physiological Optics, Wilmer Ophthalmological Institute, Johns Hopkins Medical School.

Introduction

In previous studies we have shown the effect of increase of intensity of light on important ocular functions such as acuity, speed of discrimination, speed of discrimination involving change of adjustment of the eye for distance, and power to sustain clear seeing. For these studies we selected eyes which fell in the mid-region of the group of what might be called normal healthy eyes. In general, as much care was taken in the selection of these eyes as would be exercised in selecting a physical instrument for the measurement of some magnitude or effect.

While a logical beginning, this is of course only one aspect of the problem. An outstanding field of investigation is the effect of lighting conditions on defective eyes. In this field the effect is large and the needs are special and acute. While it may be assumed that the lighting conditions which give good vision are a basic requirement for all eyes, the amount of damage done by harmful factors has not the same importance nor even the same ranking as to importance in all classes of eyes. Each of the following classes of defect, at least, should have separate and special attention—errors in refraction and muscle balance, presbyopia, and diseases and defects of the sensorium. Doubtless the latter class should be still further subdivided. Color of light, for example, is a much more harmful factor in some conditions and diseases of the eye than in others. Also a wider variety of needs with regard to intensity of light is found. In brief, the requirements of the old and the defective eye in relation to lighting conditions are an important and almost virgin field for study. The results of further work in this field will be reported in later papers.

Two divisions have been made of the present study: the effect of intensity of light on the near point of vision, and the effect of intensity of light on the eye's tolerance of defective coordination of accommodation and convergence. A special feature of the first is a comparison of the effect of intensity of light on the near point of vision for young and old eyes; the second deals primarily with one aspect of the benefit of increase of intensity of light to eyes suffering from errors in refraction and muscle balance. Only the work on the first division will be reported in this paper.

In any consideration of the effect of increase of intensity of light on the visibility of objects the following princi-

ples should be borne in mind. Roughly speaking, objects are seen because of their size and their difference from background. With a given physical difference from the background, i.e., a given difference in reflection factor, the apparent or sensation difference increases rapidly with increase of intensity of light. This difference is greater in case of white on black or light objects on a dark background than for black on white or dark objects on a light background. Whether there is also an effect on the apparent size of the object has not yet been fully determined. It is well known that an increase in size of object functions in some unknown relation as increase of brightness, but the converse of this has not as yet received much investigation. The effect, if any, is probably small.

Among the beneficial effects of increase of intensity of light on the efficiency of performance and welfare of the eye, the following six may be noted and discussed:

1. There is, as is indicated, an increase of visibility of objects. This has been demonstrated in the following ways in previous papers[1]. It has been shown: (a) that there is an increase of acuity as ordinarily conceived and measured, i.e., an increase in the power to discriminate detail with an uncontrolled or practically uncontrolled time of exposure to the eye; (b) that with a given relation of object to background there is a much greater increase in the speed of discrimination, i.e., in the minimum time required to discriminate a given detail, and a still greater increase in the power to sustain the clear discrimination of a given detail; and (c) that there is an increase in speed of discrimination involving a change in adjustment of the eyes for different distances.

2. Other conditions being equal, there is with an optimum intensity of light a decrease in ocular discomfort and other signs of strain and fatigue. This is an obvious corollary of the effect of intensity on visibility.

3. There is an increase in the range of distance over which a given detail with a given relation to the background can be discriminated. That is, the near point approaches the eye and the far point recedes. This effect on the near point is particularly important in case of young eyes having a small range of accommodation and in the eyes of the aged.

4. There is an increase in the tolerance for a defective coordination of accommodation and convergence or an increase in the apparent power to separate these two functions. A low tolerance for this defect is a very important factor in the eyestrain experienced in uncorrected hyperopia, myopia, and early presbyopia, and a very important factor in the production of convergent squint or crossed eyes in children. As already indicated, the experimental treatment of this point will be made the subject of a later paper.

5. There is also an increase in the tolerance of any refractive defect. When satisfactorily high intensities of light are used, the correction of small defects is not so imperative, so far as the subjective experience of the patient is concerned; small inaccuracies in the correction are not so serious; and glasses do not have to be changed so frequently in case of changing conditions of refraction. All these effects are again the result of the increased visibility given to objects by the increase of intensity of illumination. Under the higher intensities of illumination the eye is able to discriminate detail in spite of slight blurring in the image. This important

[1] Ferree, C. E., and Rand, G. The effect of variations in intensity of illumination on functions of importance to the working eye. Trans. I.E.S., 1920, v. 15, pp. 769-792; The effect of variations in intensity of illumination on acuity, speed of discrimination, speed of accommodation and other important eye functions. Trans. Amer. Ophth. Soc., 1921, v. 19, pp. 259-294; The effect of increase of intensity of illumination on acuity and the question of the intensity of illumination of test charts. Amer. Jour. Ophth., 1923, v. 6, pp. 672-675; The effect of intensity of illumination on the accuity of normal eyes and eyes slightly defective as to refraction. Amer. Jour. Psychol., 1923, v. 34, pp. 244-249; Intensity of light and speed of vision studied with special reference to industrial situations. Part I, Trans. I.E.S., 1927, v. 22, pp. 79-110; Part II, *Ibid.*, 1928, v. 23, pp. 507-542.

effect is by no means to be ignored as a camouflage and remedy for the mistakes of both nature and man in the attempt to achieve a satisfactory refractive equipment for the eye. In brief, the point we especially wish to bring out in this connection, is that in every refractive anomaly that comes under advisement, two important avenues of treatment are open—the correction of the refractive system to form as clear an image as possible and the correction of lighting conditions to give the retina the optimum power to discriminate detail in the image. At best the refractionist can go only so far in the task set him. It remains for the lighting specialist to minimize the harm of the residual defects. A very great deal indeed can be done along these lines. Colorless light, a glareless field correctly balanced as to distribution of brightness, good diffusion to give a minimum of glare on the work, and optimum intensity will go a long way in improving the vision and health of any eye. The care and treatment of the defective and sick eye is an important specialty in lighting and one that is as yet undeveloped. In case of such eyes it should be remembered that the effects of bad lighting are almost unbelievably extreme to those who have not had either personal experience or the chance to observe the effect on others.

6. There is an increase in the sharpness of the image formed by the refracting system due to the contraction of the pupil. That is, the narrowing of the pupil excludes the aberration effect and other irregularities resulting from the use of the periphery of the lens and cornea and by narrowing the cone of light from each point in the object reduces the size of the diffusion circles formed by faulty focusing. The narrowing of the pupil also improves the drainage of the eye, an important physiological effect.

Another effect of size of pupil on clearness of vision may be noted here. With a given intensity of light, size of pupil is an important factor in the scatter of light by the media of the eye, therefore in what is sometimes called veiling glare. Whether this factor can be regarded as one of the positive benefits of increase of intensity of light, however, has not yet been definitely determined. Two of the points involved are: (a) the relation of coefficient of scatter in the different zones of the refracting media; and (b) the effect on vision of ratio or proportion of scattered light to total light at different levels of intensity of image.

In this paper a study has been made of the effect of increase of intensity of light on the near point. Two incentives have led to the study: (a) to show another serviceability of increase of intensity in relation to the use of the eye and (b) to show that the effect should be standardized in testing for the near point. In relation to testing, the standardization is rendered all the more necessary because by far the greatest effect of change of intensity is exerted on eyes for which the test is the most important; namely, eyes with a narrow range of accommodation, more particularly presbyopic eyes. Unfortunately, in practice the near point is tested with little agreement either as to the size of the test object that should be used or as to the intensity of its illumination. Both points of course present difficulties. So far as the magnitude of detail of the object is concerned, it is not possible to keep the angle subtended at the eye constant for the different distances at which the object must be placed unless a test object is employed the size of which can be changed in continuous series for the range of distance used. Also, so far as the intensity of illumination is concerned, special provision has to be made if the object is to receive the same amount of light at every point through the range of distance.

With reference to the first point, size of test object, it is possible to make the test under different conditions to satisfy different types of interest.

(a) A slit may be used as test object and its width varied to give a constant size of visual angle for the different distances, and blurring be made the end point of the judgment. This would test clearness of imaging almost in isolation and the results obtained would indicate primarily the effect of intensity of light on accommodation.

(b) An acuity object may be used, its size

varied to give a constant visual angle at the different distances, and acuity or the ability to discriminate detail made the criterion of the judgment. In this case the effect involves both clearness of imaging and, since the judgment is of acuity, the influence of intensity of light on the sensory function or the power to discriminate detail.

(c) The Jaeger or some equivalent test type may be used in a way resembling that ordinarily employed in determining the near point. That is, for any given observer the smallest type that can be read at the lowest intensity of illumination to be used in the test series is selected, and the near point is determined for this type at all intensities in the series. The effect in this case applies to the practical reading and working situation; also to the testing of the near point with the Jaeger and other test types as the determinations with these types are ordinarily made. The factors involved are clearness of imagery, acuity, and recognition. An objective check on the judgment may be had by using only one line or a part of a line for each judgment and covering the rest of the paragraph, the observer never being required to read the same words in successive tests or allowed to see the words to be used prior to the test.

(d) The broken circle of the Zeiss or some other good near-point chart with a detail to be discriminated which subtends a visual angle of 1 min. at 25 cm., for example, may be used. As an objective check on the judgment, this chart may be rotated and the observer be required to indicate the direction in which the opening is turned. The points tested in this procedure are the effect on clearness of imagery and on the sensory function or the power to discriminate detail.

The test noted in (a) was tried in this study but abandoned because of the difficulty of getting sufficiently high reproducibility of results for the same observer at different times unless a highly trained observer is used. The threshold of blurring seems to be a much more variable occurrence and a much more difficult phenomenon to judge than the threshold of discrimination of detail. The test noted in (b) has not been used for the following reasons: (1) No satisfactory test object is available for the determination of the near point in which changes in size and intensity of illumination can be satisfactorily made in independent series. We have devised and described an acuity apparatus[2] in which changes in intensity can be made in continuous series independent of change in size, and changes in size in practically continuous series independent of changes in intensity; but it would be very difficult to adapt this apparatus to work on the near point. And (2) determinations of the effect of increase of intensity of light on the power of the retina to discriminate detail in a blurred image and the effect, if any, on the power of accommodation can both be made more easily and more feasibly in other ways.

The tests selected for use were of the type noted in (c) and (d). While of less scientific and systematic interest than those given in (a) and (b), these tests have, as already pointed out, a direct bearing on very important practical situations. The great benefits which can be conferred on the presbyopic by providing them with higher intensities of light is a service the magnitude of which this unfortunate class alone can appreciate. Also the more definite knowledge of the effect of intensity of light on the determination of the near point of the presbyopic, more especially in the earlier stages of presbyopia, should have an important clinical value.

With reference to the second point, illumination of test object, a constant intensity of illumination was maintained by keeping the test object stationary and moving the eye, instead of the customary converse procedure. Provisions were made for the movement of the eye in continuous series as will be described later. If it were desired to move the test object, however, it would not be at all difficult to attach the source of illumination in fixed relation to the test object.

Method

Preliminary experiments showed, as might be expected, that age is an important factor in the amount of effect on the near point produced by change of intensity of light. The effect increases

[2] Ferree, C. E., and Rand, G. An acuity apparatus with attachments for testing the light and color sense and for color mixing. Arch. of Ophth., 1926, v. 55, pp. 245-256; The testing of visual acuity. III. Types of test field and a projection apparatus. Amer. Jour. Ophth., 1934, v. 17, pp. 1147-1150.

with age and is particularly marked for presbyopic eyes. In the selection of the test objects to be used, a division based on the presence or absence of presbyopia was made. In eyes without presbyopia smaller test objects were required. Also it was important to have a type of test object which gave a sensitive measure of the effect. In presbyopic eyes the effect was so great that in the interests of feasibility and convenience of working a coarser measure was permissible.

For the nonpresbyopic observers, a Zeiss near-point chart was used. This chart consists of lines of broken circles with the openings turned in different directions. The test objects in the different lines are of sizes graded to give the following acuities at 25 cm.: 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.5, and 2, the detail of the test object subtending 1 min. of visual angle at distances, respectively, of 250, 125, 83.3, 62.5, 50, 41.67, 35.7, 31.25, 27.75, 25, 16.67, and 12.5 cm. The chart is in the form of a photographic transparency backed with an opal-glass plate. It is a reduced photographic reproduction of the type printed for use at a distance of 5 meters. The details of the test characters are exceptionally clear and the chart is beautifully made. As a near-point chart it has many points of superiority. The coefficient of reflection of the chart was 50 percent. The illumination incident on the chart was 1.5, 7.5 and 37.5 ft-c. With a test chart having a coefficient of reflection of 50 percent this gave the same amount of reflected light as 1, 5, and 25 ft-c on a test chart having a coefficient of reflection of 75 percent. This selection of intensities was made in order that we might have the same effective illumination for the Zeiss chart as for the chart used for the presbyopic eyes, which has a coefficient of reflection of 75 percent.

In order that constancy of illumination might be maintained the chart was mounted in a fixed position and the change of distance was produced by changing the position of the observer. This was accomplished in the following way: The observer's head was held firm in the customary mouthbit on an upright which was securely mounted on a heavy oblong plate. The distance of the eye from the test object was accurately measured by a convenient distance gauge which need not be described in detail here. The iron plate supporting the mouthbit was moved forward and backward in a grooved track, 20 cm. long, by a coarse-screw motion. Its position at any time could be read by means of a pointer and scale graduated in millimeters suitably located at the base of the mount. The distance from the test object could thus be varied by small amounts with the head in position and the change in position read from the scale.

For this group of observers the line of five broken circles, the openings of which subtended 1 min. of arc at 25 cm., was used for all except M.T., who was unable to discriminate, at the lowest illumination used, a detail smaller than that subtending 1 min. at 50 cm. This size was used for her throughout the series. To prevent the location of the openings from being learned, the chart was attached to a rotating mount so that the direction in which the openings pointed could be varied at will. In making the test only one eye was used, the other being screened from the chart. In determining the near point, four out of five correct judgments were required. Considerable variation was found in the determinations made on different days, as might be expected, but the variation obtained at different times in the same sitting under the conditions of work used was very slight indeed. Care was taken to prevent the approach of the near point which comes with prolonged effort to see at near, particularly in the case of presbyopic eyes. As an aid to this end, in addition to frequent rest periods, the observer's head was always moved from a position within the near point towards the near point.

In preliminary experiments many points were studied before this selection of conditions of working was made, among them the effect of type of judgment. In one set of experiments we compared, for example, the difference in the near point and the effect of change of intensity of illumination on the location of the near point, when the

aim of the observation was in one case to detect just-noticeable blurring of the test object and in another when it was a just-noticeable discrimination of detail or acuity. The results of the comparison showed that the near point was closer to the eye in case of the latter judgment, but that there was little significant difference in the effect of change of intensity of illumination on the location of the near point for the two types of judgment. Because of the greater simplicity of the judgment and the provision of an objective check when the test was just to discriminate detail in the test object, this type of judgment was selected for use throughout the study.

For the presbyopic observers, the Zeiss chart was found to be unsuited to our purpose because at the lowest illumination many of them were unable to read any but the largest test characters on the chart. Further, in the upper part of the chart there were not sufficiently fine gradations in size of test character, and too few characters on a line to give an adequate test of power to discriminate. The Bausch and Lomb reading card for testing the near point was selected instead. This card comprises a series of paragraphs of print the letters of which subtend a visual angle of 5 min. of arc at 15, 20, 25, 30, 40, 50, and 60 in. Illuminations of 1, 5, and 25 ft-c were used, the same as were the effective illuminations for the Zeiss chart. The test chart was mounted in a fixed position and the change in distance was produced by changing the position of the observer. Coarse changes were made by moving the chair and table of the observer, and fine changes by the screw which moved the supporting platform of the mouthbit, as already noted in connection with the study with the nonpresbyopic observers. The test was begun at the lowest illumination to be used, the observer being asked to read the smallest type he could at any distance. This paragraph was then used for him throughout the test. Of the fourteen observers used, two read the letters which subtended 5 min. of arc at 25 in., three at 40 in., eight at 50 in., and one at 60 in.

Preliminary tests were made to compare the results obtained with the two types of test chart. For these, one nonpresbyopic and five presbyopic observers were selected. The smallest test characters of each chart that could be discriminated at the lowest intensity employed were used for each observer. The results showed that while the distance of the near point differed for the two types of chart, the percentage change in this distance produced by the same change of intensity of light was in the two cases very similar.

Results

Four sets of experiments were conducted. In the first, the tests were made on twelve observers without presbyopia, using the Zeiss near-point chart at effective illuminations of 1, 5, and 25 ft-c. The observers ranged in age from 20 to 41 years, eight occurring in the group below 30 and four in the group above 30. All wore the proper refractive correction when necessary. The results for this set of experiments are given in table 1 and figures 1 and 2.

In the second set of experiments the tests were made on fourteen presbyopic eyes with the Bausch and Lomb reading card at 1, 5, and 25 ft-c. The observers ranged in age from 42 to 53 years. All wore their refractive correction for distance only. For near seeing their corrections varied from 1 to 2 diopters. Three of them wore a near correction of 1 diopter, three of 1.5, four of 1.75, and four of 2 diopters. The results of these experiments are given in table 2 and figures 1 and 2.

The purpose of the third set of experiments was to find the knee of the curve representing the effect of change of intensity on the near point. The reading card was used as test object at 13 intensities of illumination ranging from 0.5 to 100 ft-c. Three observers were used—an emmetropic subject aged 23 years, one with a corrected myopia aged 44, and one with presbyopia aged 52 years. The second of these observers did not require a correction for near seeing. The correction for the third observer for near seeing was +1.75 D.sph.

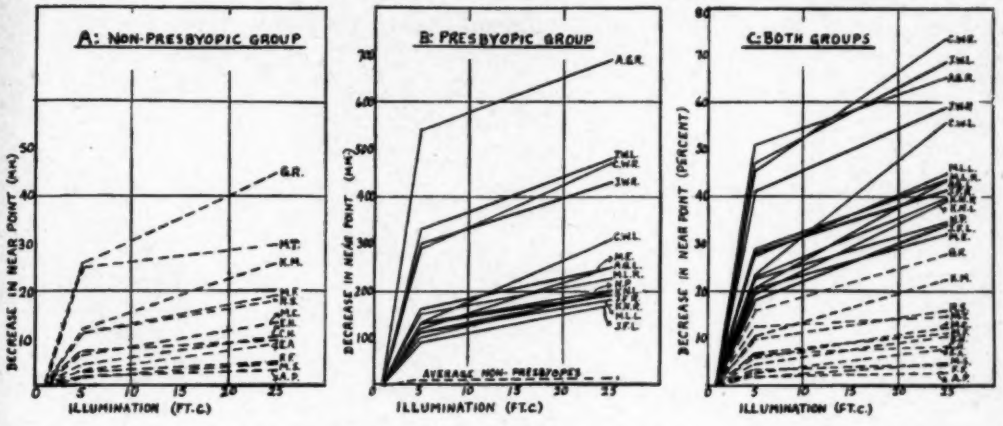

Fig. 1 (Ferree and Rand). The effect of increase of intensity of illumination on the near point of vision: A, decrease of near point in millimeters for 12 nonpresbyopic subjects; B, decrease of near point in millimeters for 14 presbyopic subjects and for the average of the nonpresbyopic group; C, percentage change in near point for both groups. Range of intensity of illumination: 1 to 25 ft-c. Data for the nonpresbyopic group in broken lines, for the presbyopic group in solid lines.

Table 1

SHOWING FOR 12 OBSERVERS WITHOUT PRESBYOPIA THE EFFECT OF INTENSITY OF ILLUMINATION ON THE NEAR POINT OF VISION. RANGE OF INTENSITY OF ILLUMINATION: 1 TO 25 FT-C. TEST OBJECT: BROKEN CIRCLE

Observer	Age	Distance at which detail of broken circle subtends 1 min. (cm.)	Near point (cm.)			Apparent diopters of accommodation		
			1 ft-c	5 ft-c	25 ft-c	1 ft-c	5 ft-c	25 ft-c
M.C.	20	25	10.75	10.10	9.43	9.30	9.90	10.60
E.H.	22	25	10.10	9.65	9.05	9.90	10.36	11.05
A.P.	22	25	10.80	10.60	10.50	9.26	9.43	9.52
F.F.	22	25	11.10	10.70	10.60	9.01	9.34	9.43
K.M.	23	25	11.70	10.50	9.10	8.55	9.52	10.98
C.H.	23	25	11.35	10.63	10.40	8.81	9.40	9.61
M.S.	23	25	9.82	9.64	9.35	10.18	10.37	10.70
E.A.	24	25	11.30	11.00	10.40	8.85	9.09	9.61
M.F.	30	25	17.20	16.10	15.30	5.81	6.21	6.53
R.S.	30	25	11.20	10.10	9.40	8.93	9.90	10.63
G.R.	40	25	16.20	13.60	11.70	6.17	7.35	8.54
M.T.	41	50	19.80	17.30	16.85	5.05	5.78	5.93
Average			12.61	11.66	11.01	8.32	8.89	9.44

The observers were so selected as to show the effect of age with and without presbyopia. The results of the experiments are given in table 3 and figure 3.

In the fourth set of experiments an attempt was made to analyze in part the effect of intensity of light on the near point by eliminating the factor of size of pupil from the results. This was done with observer G. R. at 1, 5, and 25 ft-c. The reading card was used as test object and a comparison was made of the effect of increase of intensity of light on the near point, (a) with the natural pupil; (b) with a constant size of pupil and the same illumination of the test card as in (a); and (c) with a constant size of pupil and the illumination compensated so that the same amount of light entered the eye as in (a). For these experiments a well-centered artificial pupil was used, 2.56 mm.

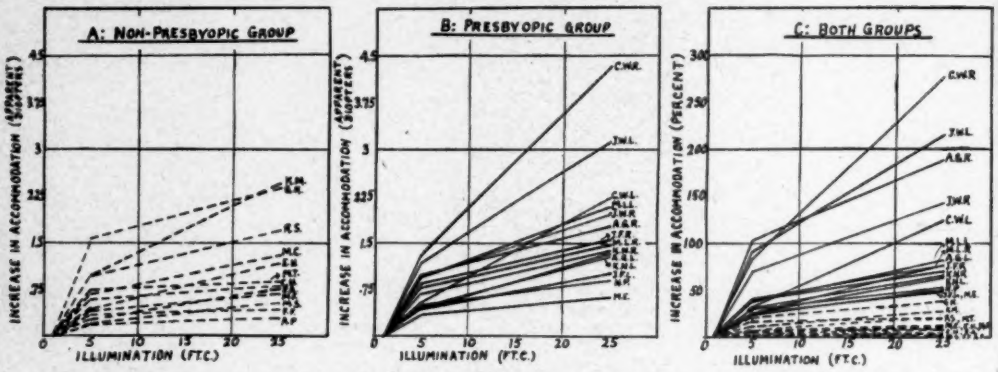

Fig. 2 (Ferree and Rand). The effect of increase of intensity of illumination on the apparent diopters of accommodation: A, increase in apparent diopters for 12 nonpresbyopic subjects; B, increase in apparent diopters for 14 presbyopic subjects; C, percentage change in apparent diopters for both groups. Range of intensity of illumination 1 to 25 ft-c. Data for the nonpresbyopic group in broken lines, for the presbyopic group in solid lines.

Table 2

SHOWING FOR 14 OBSERVERS WITH PRESBYOPIA THE EFFECT OF INTENSITY OF ILLUMINATION ON THE NEAR POINT OF VISION. RANGE OF INTENSITY OF ILLUMINATION: 1 TO 25 FT-C. TEST OBJECT: BAUSCH AND LOMB READING CARD

Observer	Age	Correction for near	Distance at which test letters subtend 5 min. (in.)	Near point (cm.)			Apparent diopters of accommodation		
				1 ft-c	5 ft-c	25 ft-c	1 ft-c	5 ft-c	25 ft-c
J.F.R.	40	+1.00	25	46	33	27	2.17	3.03	3.70
J.F.L.	40	+1.00	25	50	41	33	2.00	2.44	3.03
M.E.	46	+1.00	60	78	62	53	1.28	1.61	1.89
N.P.	50	+1.50	50	58	45	38	1.72	2.22	2.63
K.N.R.	50	+1.50	50	48	37	29	2.08	2.70	3.45
K.N.L.	50	+1.50	50	51	41	31	1.96	2.44	3.23
M.L.R.	51	+1.75	50	52	37	29.5	1.92	2.70	3.39
M.L.L.	51	+1.75	50	40	29	22	2.50	3.45	4.55
A.G.R.	52	+1.75	50	106	52	37	0.94	1.92	2.70
A.G.L.	52	+1.75	40	58	46	33	1.72	2.17	3.03
C.W.R.	53	+2.00	40	64	35	17	1.56	2.86	5.88
C.W.L.	53	+2.00	40	56	43	25	1.79	2.33	4.00
J.W.R.	55	+2.00	50	73	43	30	1.37	2.33	3.33
J.W.L.	55	+2.00	50	70	37	22	1.43	2.70	4.55
Average				60.7	41.5	30.5	1.75	2.49	3.53

in diameter, 5.15 sq. mm. in area, placed 9.25 mm. in front of the eye. The results are given in table 4 and figure 4.

The data obtained in the above experiments have been specified in the tables in terms of distance of the near point and apparent diopters of accommodation at the different levels of intensity used, and in the charts in terms of linear and percentage decrease in the distance of the near point, and dioptric and percentage increase in apparent accommodation with increase in intensity. In calculating percentage change, the value for the lowest intensity was always taken as base.

In figures 1 and 2 the results for the group without presbyopia are given in chart A and for the group with presbyopia in chart B. The percentage values for both groups are combined in chart C. In figure 1 the data are specified in terms of distance of the near point and in figure 2 in terms of apparent diopters

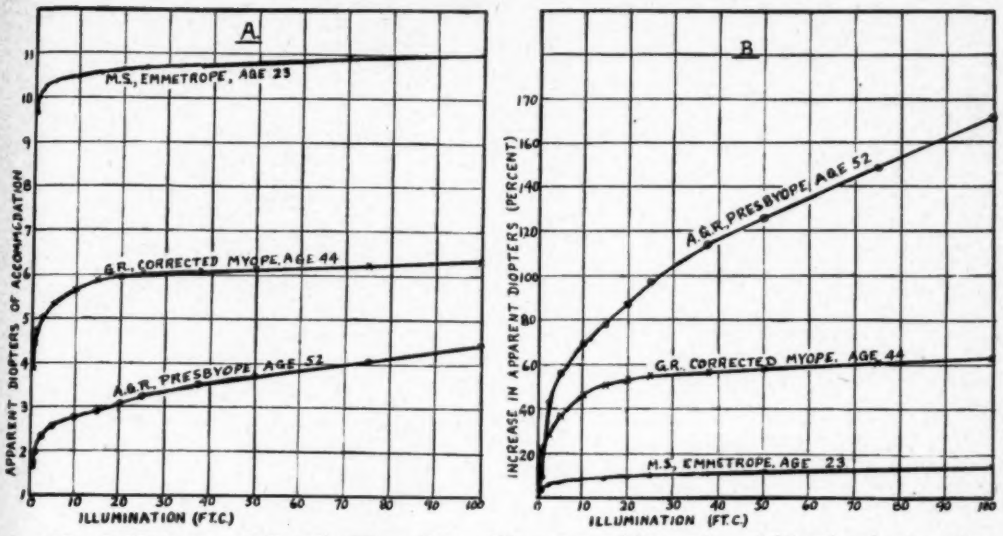

Fig. 3 (Ferree and Rand). The effect of increase of intensity of illumination on the apparent diopters of accommodation for an emmetropic subject aged 23 years, for one with a corrected myopia aged 44 years, and for one with presbyopia aged 52 years: A, apparent diopters of accommodation plotted against intensity of illumination; B, percentage increase in apparent diopters of accommodation plotted against intensity of illumination. Range of intensity of illumination: 0.5 to 100 ft-c.

Table 3

SHOWING THE EFFECT OF INCREASE OF INTENSITY OF ILLUMINATION ON THE NEAR POINT FOR AN EMMETROPIC SUBJECT, AGED 23 YEARS, ONE WITH A CORRECTED MYOPIA, AGED 44 YEARS, AND ONE WITH PRESBYOPIA, AGED 52 YEARS. RANGE OF INTENSITY OF ILLUMINATION: 0.5 TO 100 FT-C. TEST OBJECT: BAUSCH AND LOMB READING CARD

Intensity of illumination (ft-c)	Observer M.S., aged 23 years. Type read no. 15		Observer G.R., aged 44 years. Type read no. 15		Observer A.G., aged 52 years. Type read no. 50	
	Near point (cm.)	Apparent diopters of accommodation	Near point (cm.)	Apparent diopters of accommodation	Near point (cm.)	Apparent diopters of accommodation
0.5	10.35	9.66	25.8	3.88	61.0	1.64
0.75	10.04	9.96	22.4	4.46	58.0	1.72
1.0	9.82	10.18	21.2	4.72	51.0	1.96
2.5	9.72	10.29	19.9	5.03	42.5	2.35
5.0	9.64	10.37	18.8	5.32	39.0	2.56
10.0	9.56	10.46	17.6	5.68	36.0	2.78
15.0	9.45	10.58	17.1	5.85	34.5	2.90
20.0	9.40	10.64	16.8	5.95	32.5	3.08
25.0	9.35	10.70	16.6	6.02	31.0	3.23
37.5	9.30	10.75	16.4	6.10	28.5	3.51
50.0	9.24	10.82	16.25	6.15	27.5	3.64
75.0	9.14	10.94	16.0	6.25	24.5	4.08
100.0	9.04	11.06	15.8	6.33	22.5	4.44

of accommodation. The linear changes in distance of the near point with change of intensity differed so widely for the two groups of observers that it was impossible to chart them on the same scale of ordinates. The results for the presbyopes are therefore plotted to a scale reduced ten times as compared with that for the observers without presbyopia. For comparison the average values for the latter group are plotted also on this chart.

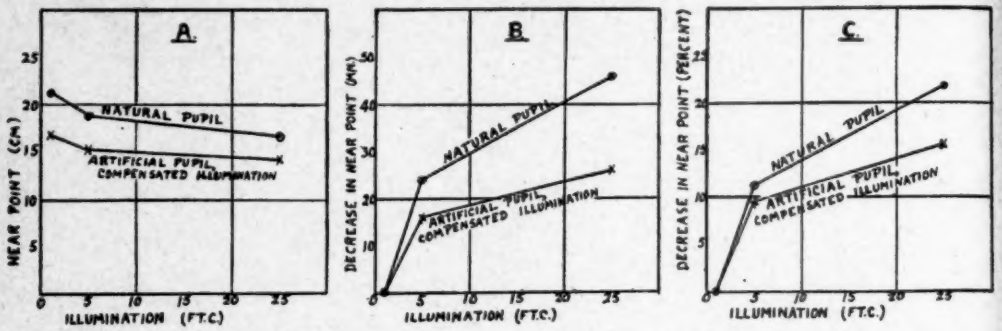

Fig. 4 (Ferree and Rand). Effect of increase of intensity of illumination on the near point of vision with the natural pupil and with an artificial pupil: A, distance of near point in centimeters plotted against intensity of illumination; B, decrease of near point in millimeters plotted against intensity of illumination; C, percentage change in near point plotted against intensity of illumination. With the artificial pupil, the intensity of illumination on the test object was increased in proportion to the reduction in area of pupil so that the same amount of light entered the eye with the artificial as with the natural pupil.

Table 4

SHOWING THE EFFECT OF INCREASE OF INTENSITY OF ILLUMINATION ON THE NEAR POINT OF VISION (A) WITH THE NATURAL PUPIL; (B) WITH AN ARTIFICIAL PUPIL AND THE SAME ILLUMINATION OF THE TEST CARD AS IN (A); AND (C) WITH THE ARTIFICIAL PUPIL AND THE ILLUMINATION COMPENSATED FOR THE REDUCTION OF PUPIL SIZE SO THAT THE SAME AMOUNT OF LIGHT ENTERS THE EYE AS IN (A)

Intensity of illumination (ft-c)	Size of pupil		Near Point cm.	Change produced by change of intensity		Apparent diopters of accommodation	Change produced by change of intensity	
	Diameter (mm.)	Area (sq. mm.)		mm.	percent		D.	percent
			A.					
1	3.45	9.35	21.2			4.72		
5	3.276	8.43	18.8	24	11.3	5.32	0.60	12.7
25	2.76	5.98	16.6	46	21.7	6.02	1.30	27.6
			B.					
1	2.56	5.15	20.0			5.00		
5	2.56	5.15	17.2	28	14.0	5.81	0.81	16.2
25	2.56	5.15	15.0	50	25.0	6.67	1.67	33.4
			C.					
1.82	2.56	5.15	16.8			5.95		
8.18	2.56	5.15	15.2	16	9.5	6.58	0.63	10.6
29.03	2.56	5.15	14.2	26	15.5	7.04	1.09	18.4

The results may be summarized as follows: (1) There is a considerable effect of increase of intensity of light on the distance of the near point and, therefore, on the apparent diopters of accommodation at all ages, but a much greater effect for presbyopic than for nonpresbyopic eyes and for middle-aged and old than for young eyes.

(2) In the group of observers without presbyopia, ranging in age from 20 to 41 years, the effect of change of intensity on the distance of the near point was with one exception greater for those above than below 30 years of age. For the group aged less than 30 years, the distance of the near point decreased 1.8–12 mm. or 2–11 percent for an increase of intensity from 1 to 5 ft-c; and for the group aged more than 30 years, 11–26 mm. or 6–16 percent. For an increase from 1 to 25 ft-c the distance

decreased 3–26 mm. or 3–22 percent for the younger group and 18–45 mm. or 11–28 percent for the older group.

(3) In the presbyopic group of observers, ranging in age from 40 to 53 years and in strength of correction for near vision from 1 to 2 diopters, the effect of change of intensity on the distance of the near point was most marked for the observers requiring the stronger corrections. For those whose correction for near seeing was less than 1.75 diopters, the distance of the near point decreased 90–160 mm. or 18–28 percent for an increase of intensity from 1 to 5 ft-c, and for those whose correction was 1.75 diopters or greater, 110–540 mm. or 21–51 percent. For an increase from 1 to 25 ft-c the distance decreased 170–250 mm. or 32–41 percent for the group with the weaker correction for near, and 180–690 mm. or 43–73 percent for those wearing a correction of 1.75 diopters or greater.

(4) Similarly, the increase in apparent diopters of accommodation with increase of intensity of light was with one exception greater for the group without presbyopia who were above 30 years of age and in the presbyopic group for those whose correction for near seeing was 1.75 diopters or greater. The ranges of increase in apparent diopters for these groups are as follows: For the group without presbyopia who were less than 30 years of age, there was increase in apparent diopters of 0.18–0.98 or 2–11 percent for an increase of intensity from 1 to 5 ft-c, and for those more than 30 years, of 0.4–1.19 diopters or 7–19 percent. For an increase from 1 to 25 ft-c the increase in apparent diopters was 0.27–2.44 or 3–29 percent for the younger group and 0.72–2.38 diopters or 11–39 percent for the older group. For the presbyopic observers whose correction for near seeing was less than 1.75 diopters, the increase in apparent diopters of accommodation was 0.33–0.86 or 22–40 percent for an increase of intensity from 1 to 5 ft-c, and for those whose correction was 1.75 diopters or greater, 0.45–1.3 or 26–105 percent. For an increase of illumination from 1 to 25 ft-c for the observers with the weaker presbyopic correction there was an increase in apparent diopters of 0.61–1.53 or 48–71 percent; and for those with the stronger correction, of 1.31–4.32 or 76–277 percent.

(5) The knee of the curve of intensity of illumination plotted against apparent diopters of accommodation occurs at different intensities for the three observers used for making this determination. The curve for the emmetropic subject, aged 23 years, has a sharp rise between 0.5 and 2.5 ft-c and then a very gradual rise to 100 ft-c; that for the one with corrected myopia, aged 44, has a very sharp rise between 0.5 and 2.5 ft-c, a more gradual but still pronounced inclination up to 20 ft-c and then a gradual rise to 100 ft-c; that for the one with presbyopia, aged 53, has a very sharp rise between 0.5 and 5 ft-c and then a less rapid but still very pronounced rise which continues until 100 ft-c. A significant point brought out in these curves is the very great benefit of increase of illumination experienced by the presbyopic up to 100 ft-c. This fact is made still more evident in the cases showing the percentage increase of apparent diopters of accommodation with increase of intensity of light. The curves for percentage increase show in general the same characteristics as those for simple increase with the exception that the benefit of increase of intensity with increase of age is more pronounced throughout.

(6) The contraction of the pupil causes a part but by no means the greater part of the approach of the near point at the higher intensities. A comparison of the distance of the near point at three intensities with the natural pupil, ranging in diameter from 3.45 to 2.76 mm., and with an artificial pupil of a diameter of 2.56 mm. shows that with the same amount of light entering the eye in each case, approximately one third of the percentage change in the near point produced by increasing the illumination from 1 to 25 ft-c or its equivalent is due to the greater focusing action of the smaller sizes of pupil at the higher intensities; approximately two thirds of the effect is inherent in the sensory and percep-

tive reactions.

It will be seen from the above results that the benefit of increase of intensity of illumination to the presbyopic eye is great. That a change of intensity of light from 1 to 25 ft-c should appear to add as much as 4 diopters to the range of accommodation is somewhat astounding. The need of the presbyopic for reading glasses sustains some unknown inverse relation to the intensity of light used. Further results on this point will be given in a later paper.

Intensity of light as well as correcting glasses should be kept in mind as one of the aids in presbyopia. By giving due attention to this fact one of the present writers has reached the age of 57 without having worn a presbyopic correction and without having experienced any significant change in his range of accommodation for several years. Whether the continual demands put upon accommodation have had anything to do with the slow loss of the power to accommodate in this particular case, we are not prepared at present to say. We are careful to state also that the above citation is made as an interesting possibility, not as a basis of any recommendation for practice. It does seem, however, that when once the aid of corrective glasses is accepted and continuously used, accommodation fails rather quickly. Perhaps one has to choose between the avoidance of strain on the one hand and a continuation of the exercise of the power to accommodate and its probable tendency to preserve that power, on the other. Just what compromise, if any, should be made is difficult to say; it doubtless varies greatly with different eyes. However, if it is desired to resort as little as possible to corrective aid, the proper conditions of lighting will be found to be of great service. It would seem to the present writers that extremes in either direction should be avoided and that careful judgment is needed to preserve the powers of the aging eye, particularly in the earlier stages of presbyopia. What the effect of accommodation on the properties of the lens is, it is perhaps difficult to say, but innervation and muscle action are accommodative functions and it may be that sometimes they are allowed to atrophy unnecessarily. On the other hand we are fully cognizant of the fact that no good comes from straining the powers of an organ, particularly at a stage of life when strain is the most dangerous.

It is most certainly not our intention here to profess a knowledge and insight that we do not have, nor our wish to encourage unsafe experimentation. Our purpose is rather to make an earnest plea that still greater attention be given to the study and care of the presbyopic eye. If for no other reason, presbyopia is important because it is the common heritage of the race. The mitigation, so far as possible, of the blasting effects of age is our most important scientific and medical problem. Old age is the most fatal sickness that we have.

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FATIGUE OF CONVERGENCE INDUCED BY READING AS A FUNCTION OF ILLUMINATION INTENSITY

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The decrement in the amplitude of convergence of the internal recti muscles due to reading for one hour under an intensity of illumination of one foot-candle was found to be three times as great as it was under 100 foot-candles. This symptom of ocular fatigue practically disappeared within a period of ten minutes after the cessation of the reading. The data were obtained by means of a recently designed convergence ergograph and possess a high degree of statistical reliability. These data provide additional evidence that at least 100 foot-candles are desirable for reading under usual conditions. From the Lighting Research Laboratory, General Electric Company.

The present investigation is primarily concerned with the effects of critical visual effort upon the tonus of the extrinsic ocular muscles. This empirical method for investigating a phase of ocular fatigue is not a new one[1]. However, it is unique in that it involves the performance of a universal visual task under conditions which are usual in practice. The experimental data are considered, therefore, as useful criteria in the field of ocular hygiene for the specification of physical conditions which will be most favorable for seeing[2]. Since our purpose is to obtain evidence which will be symptomatic of ocular fatigue, it is obvious that an analysis of the *relative* fatigue induced in the muscular systems of accommodation[3] and convergence[4] is not essential. In addition, this study is limited to cases which do not involve known pathologic conditions.

The specific objectives of the research are (1) to determine the decrement in the amplitude of convergence due to reading for an hour under intensities of illumination of 1 and 100 foot-candles, respectively; (2) to investigate the duration of this effect after the cessation of the reading; and (3) to determine the influence of a day's work in an office upon reserve convergence.

Technic and apparatus

The internal recti muscles were caused to contract by means of a convergence ergograph until diplopia occurred. This ergographic technic may be described as a repeated-effort method. A series of twenty successive contractions of these muscles was recorded on the drum of a kymograph immediately preceding and following each period of reading. In addition, a third series of twenty measurements was recorded after a ten-minute period of rest during which seeing was casual. The latter measurements were made only under the lower level of illumination. This cycle of events was repeated at intervals of three or four days for each of nine adult subjects. The intensity of illumination under which the reading was done was alternately 1 and 100 foot-candles for the successive test periods.

The ergograph, designed by the authors is illustrated in figure 1. It consists essentially of a pair of rotary prisms which are operated by a small synchronous motor. The angle through which the prisms rotate is controlled by a magnetic clutch interposed between the motor and the prisms. The entire mechanism is mounted upon an adjustable stand in such a manner that the prisms are opposite the right eye of the subject. In this research, it was not considered necessary to use a headrest.

The prisms revolve slowly and uniformly when the subject presses a key which simultaneously operates the magnetic clutch and the recording mechanism of the kymograph. At the instant at which the test object (small black letter E) is seen double, the key is released and the prisms rapidly revolve to their original position. This motion is obtained through spring action. Hence, the apparatus is essentially automatic in operation. Although the intervals between successive trials were not controlled, it was found that the

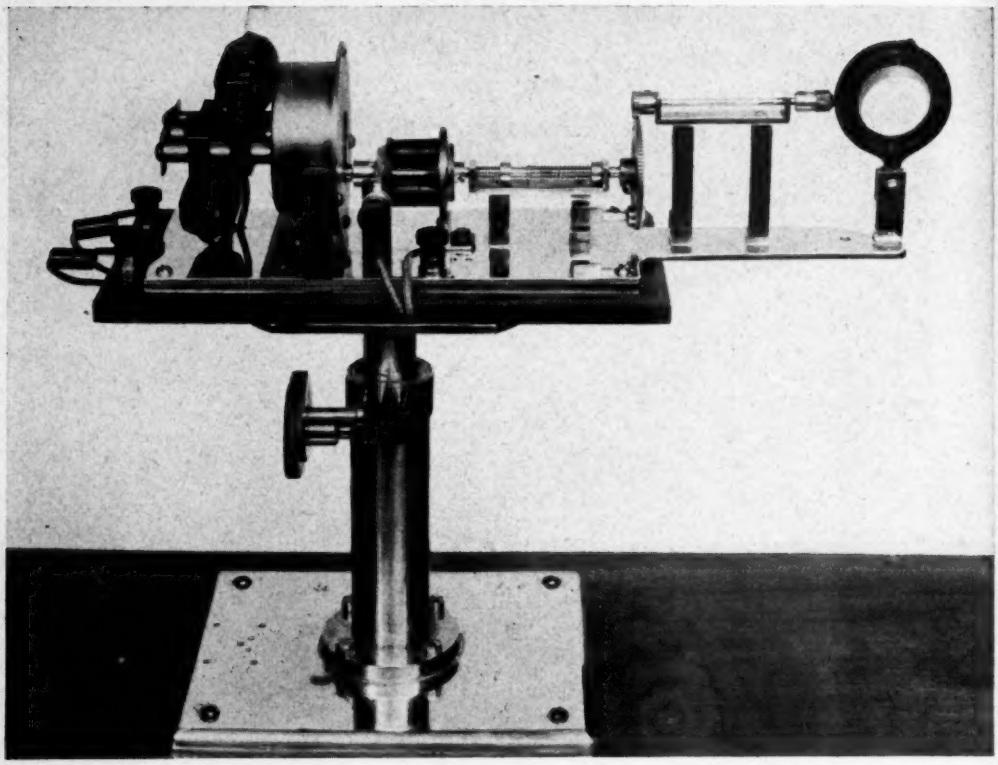

Fig. 1 (Luckiesh and Moss). A new form of convergence ophthalmic ergograph. The illustration shows the side view away from the observer.

subjects soon adopted a rhythmic procedure involving rest periods of approximately two seconds between trials. The slight errors due to the action time of the apparatus and the reaction time of the subjects, inherent in this method, are obviously insignificant.

It was considered advisable, for reasons of analysis and interpretation, to maintain the same fixational distance during the periods of reading and operation of the ergograph. Accordingly, the test object for the ergograph was placed at a distance of fourteen inches from the eyes. Since the experimental data of Ferree and Rand indicate that the near point of vision is a function of the brightness of the visual field[5], this possible extraneous factor was eliminated by taking all ergograph measurements under identical brightness conditions. Actually, the test object appeared upon an extended white field which was illuminated to an intensity of ten foot-candles. This arrangement thus introduces retinal adaptation as a variable, since the reading was performed under brightness conditions differing from those of the ergograph field.

The subjects were instructed to read silently and at their natural rate during the hour of reading. They were particularly cautioned against regarding the procedure as a "speed test."

Results

The average amplitude of convergence of the internal-recti muscles for the various experimental conditions is presented in tables 1 and 2.

Decrements in the amplitude of convergence of 3.0 and 1.0 diopters were observed after reading for one hour under intensities of illumination of 1 and 100 foot-candles, respectively. Therefore, the assumption is made that muscular fatigue produced by reading, as

Table 1

THE INDIVIDUAL DATA PRESENTED REPRESENT THE ARITHMETIC MEAN OF TEN SEPARATE TESTS FOR SUBJECTS 1 AND 2; AND THE MEAN OF FIVE SEPARATE TESTS FOR ALL OTHER SUBJECTS. THE CORRESPONDING RELATIVE PROBABLE ERRORS, IN PERCENT, ARE GIVEN IN COLUMNS 6 TO 9 RESPECTIVELY

Subject	Prism Strength—Diopters				Percent Relative Probable Error			
	100 ft-c		1 ft-c		100 ft-c		1 ft-c	
	Before Reading	After	Before	After	Before Reading	After	Before	After
1*	12.3	12.0	13.6	10.0	2.0	2.2	1.7	2.4
2*	19.6	18.2	20.9	15.4	1.2	1.4	1.1	1.3
3	18.3	15.4	18.1	14.8	1.1	1.3	1.0	1.3
4	25.1	25.4	25.1	24.1	1.0	0.9	1.2	1.4
5	6.9	7.4	7.7	6.4	1.4	1.5	1.0	1.2
6	19.2	18.4	17.9	16.8	0.8	1.3	1.1	0.9
7	19.0	18.0	17.2	13.9	0.8	0.8	1.0	1.4
8	10.1	8.0	13.8	9.7	2.3	2.2	3.3	2.9
9*	16.5	14.6	16.7	13.0	0.6	1.0	0.5	1.0
Geometric Mean	15.3	14.3	16.0	13.0	0.5	0.5	0.5	0.6

* Correction worn

indicated by changes in the tonicity of the internal-recti muscles, is approximately three times as severe under the lower level of illumination as it is under the higher. This conclusion is even more significant in view of the fact that the subjects read nearly ten percent faster in the latter case even though they were cautioned to read at a natural rate. The relative probable errors of the average convergence reserve being considerably less than 1 percent, the data have a high degree of statistical reliability.

Since the brightness of the pages of the book was either one tenth that of the ergograph field or ten times as great, this factor is to be considered in the interpretation of the results. It appears reasonable to assume that the sudden transition from the higher brightness of the book to the lower brightness of the ergograph field would adversely affect the power of convergence due to incomplete retinal adaptation. This effect would not be expected when the change was from the lower to the higher brightness. Hence the conclusion regarding the relative fatigue of reading under these two levels of illumination is considered as a conservative one.

These data provide an additional link in the chain of experimental evidence[6] which indicates that at least 100 foot-candles are desirable for reading under usual conditions. This conclusion is based upon the assumption that preventable glare[7] and other negative visual factors are not present in the lighting environment. It is obvious that this conclusion is not applicable to certain cases involving pathology.

Table 2

THE INDIVIDUAL DATA REPRESENT THE ARITHMETIC MEAN FROM FIVE SEPARATE TESTS FOR EACH OF THE SUBJECTS

Subject	Prism Strength—Diopters		
	1 ft-c		
	Before Reading	After Reading	After 10 Min. Rest
1	17.1	13.9	17.0
2	23.4	18.2	22.9
3	14.6	11.6	13.3
4	—	—	—
5	7.5	6.1	7.4
6	19.6	17.2	19.0
7	16.6	13.4	16.5
8	13.8	9.7	14.2
9	16.8	12.7	16.3
Geometric Mean	15.5	12.3	15.2

An analysis of the data taken ten

minutes after the cessation of reading indicates that these symptoms of ocular fatigue, due to an hour's reading of large print, practically disappear during this brief period of casual seeing, as will be noted from table 2. It is of theoretical interest at least to compare the effects of rest (from reading) upon the tonus of the ocular muscles with other physiologic reactions. In a recent research[8], it was shown that a period of about thirty minutes of rest was required to dissipate the effects upon the heart rate which resulted from reading for one hour under one foot-candle.

The third phase of the present research established the fact that the effects of critical visual effort involved in a day's work in an office, as indicated by ergographic measurements, were not of an accumulative character. No difference was observed in convergence reserve at the beginning and close of the work-day, provided a rest period of fifteen minutes preceded the measurements. Apparently, the interruptions in close visual work throughout the day were sufficient to prevent an accumulation of this effect upon these ocular muscles. However, the fact that the subjects worked under excellent conditions for seeing during the day may be a significant factor in this case.

It is conceivable that the time required to dissipate muscular fatigue may eventually prove to be an important datum in the field of ocular hygiene for determining the duration of rest periods. Such data would be particularly significant when applicable to children and those with severe visual disorders. However, it is not within the scope of this paper to discuss the clinical significance of the data.

Theoretical considerations

A possible explanation of the greater decrement in the amplitude of convergence under the lower level of illumination is that a more exact state of fixation is required due to the lower visibility of the printed characters. Such a situation may be analogous to the greater strain experienced in aiming a rifle at a small target than at a large one. This supposition at least appears reasonable from a quantitative basis. Experimental data relating extent and brightness for the liminal visual stimulus[8] establish the fact that an object must be approximately 1.8 times as large to be visible under 1 foot-candle as it needs to be under 100 foot-candles. A differential in threshold size of this magnitude would permit considerable variation in the oculomotor habits of the reader in the two situations.

It might be contended that the greater fatigue of the internal-recti muscles indicated under the lower level of illumination resulted from a larger number of fixational pauses during the reading. It has been shown that the frequency of fixational pauses is a function of the complexity of the objects of regard[9]. Hence, if it is assumed that decreased visibility and greater complexity are similar factors in this respect, the explanation of a differential in fixational pauses may be given some credence. However, the fact that the subjects read nearly ten percent faster under the higher level of illumination makes such an explanation less attractive.

The authors acknowledge their indebtedness to Mr. S. K. Guth for his assistance in the prosecution of this research.

Nela Park.

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USE OF SCLEROSING SOLUTIONS IN OPHTHALMIC THERAPEUTICS

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The literature concerning the use of sclerosing solutions in ophthalmology is reviewed. Two cases of a hemangioma of the lid and one of cysts of the conjunctiva are reported, in which treatment was with dilutions of a sclerosing solution consisting of four parts of quinine hydrochloride, two parts urethane, and thirty parts water. Observation as to the technic and results of treatments are given with the conclusion that sclerosing solutions are a valuable addition to the armamentarium of the ophthalmologist in cases in which no other form of therapy offers a reasonable chance of success, but that their use is not without danger unless all the necessary, mentioned precautions are observed. From the Departments of Ophthalmology and Experimental Medicine, University of Southern California Medical School. Read before the American Academy of Ophthalmology and Otolaryngology, in Chicago, September 11, 1934.

Instances of the use of sclerosing solutions for the treatment of ophthalmological conditions are rather rare in ophthalmological literature.

In 1925 Raverdino[1] reported the treatment of a patient who suffered with intermittent exophthalmos due to a varix of the orbit by injection of a solution consisting of four parts of quinine hydrochloride, two parts of urethane, and thirty parts of distilled water. He had the patient hold his breath to produce a stasis of the circulation in the varix and then passed a needle to a depth of three centimeters along the inferior wall of the orbit. In order not to inject the solution directly into the lumen of a vessel the point of the needle was moved about until no blood was obtained on aspiration. Then 0.2 c.c. of the above-mentioned quinine-urethane solution was injected into the orbit, following which there was severe pain for about five minutes, After this the patient was able to go home but there were intermittent pains during the night. The right side of the face became swollen with dilatation of the facial and orbital veins. The next morning outward rotation caused some pain, but after the application of cold packs only slight discomfort remained. After two days this patient appeared normal except that the facial veins were visible under the skin. These increased in size on holding the breath. One week later this injection was repeated but this time the pain was very much less. Following the second injection there was gradual improvement until after six months the patient was entirely cured. This writer stresses the importance of injecting the solution into the orbital tissue outside the lumen of the vessel and states that the optic nerve was not damaged by the injection.

Weekers[2] in 1933 cited the case of Raverdino as a precedent and reported one of his own. His patient was thirty-seven years old and had an orbital varix in the left eye which followed a blow at the age of eight years. Varicose veins could be seen in the lower cul-de-sac. Under excitement or holding the breath a marked exophthalmos of the left eye occurred. Radium therapy was used without improvement. After the injection of 2 c.c. of novocain into the lower outer portion of the orbit to a depth of three centimeters, 1.5 c.c. of the quinine-urethane solution was injected at the same point. The next day the reaction

was such as to produce an ecchymosis of the face and lids on the left side. This disappeared in fifteen days. The varicose veins in the lower cul-de-sac vanished, and a slight enophthalmos was produced so that the eye never protruded farther than the other eye even on jugular compression. The cure persisted when the patient was observed four-and-one-half years after treatment.

Weekers called attention to the observation of Bensaude and Oury that an endophlebitis and periphlebitis are caused by the injection of this quinine solution in the connective tissue surrounding the vessels without actually having it enter the vessels themselves. By this means he explains the beneficial effect obtained by injecting the solution into the orbit without attempting to gain access to the vessel lumen. He concludes that sclerosing injections constitute the treatment of choice in orbital varicocele.

A different use for sclerosing solutions was reported by Terson[3] in 1931, the subcutaneous injection of a five-percent solution of quinine dihydrochloride and urea having successfully overcome a spastic entropion. In a case of senile ectropion the same writer injected 0.5 c.c. of the solution submucously in the inner third of the lower lid and 0.25 c.c subcutaneously at the outer angle. The scar tissue thus produced gave just as good an effect as if an operation had been performed.

The above-cited instances of the use of sclerosing solutions show that solutions which have their sclerosing effect due to quinine have been preferred. Perhaps this is because these solutions are in particular vogue in France.

From an analysis of the general literature on sclerosing solutions, which has become quite voluminous in recent years, an attempt may be made to determine which ones could be applied to ophthalmological therapy.

The principal use today of sclerosing solutions is in the treatment of varicose veins. In 1917 Sicard[4] noticed the obliteration of veins after injection of arsenicals for the treatment of lues. This focused his attention on a chemical method of obliterating veins and after considerable experimentation he found sodium salicylate to be most satisfactory for this purpose. However, when this salt is injected outside the vein, severe necrosis occurs, and it is no longer used today by most operators.

In 1922 Genevrier[5] published an observation that in the treatment of malarial patients by the intravenous injection of quinine, if too great a concentration of the solution were used thrombosis of the vein occurred. This would result in its obliteration. He was using a solution of quinine hydrochloride and urethane. Therefore in France this solution of quinine and urethane and also the five-percent solution of quinine and urea became popular for use in the obliteration of varicose veins. These solutions also may cause necrosis if injected outside the vein.

More recently many other solutions have been tried for producing sclerosis of varicose veins, amongst them being high concentrations of the various sugar solutions and some of the salts of fatty acids such as sodium morrhuate.

Ochsner and Garside[6] have tried experimentally the effect of injecting these various solutions into the veins of dogs, and examined the veins histologically after treatment. A forty-percent solution of sodium salicylate produced the greatest number of thrombi. The endothelial destruction caused by quinine and urea was far greater than that of concentrated dextrose solution.

Kilbourne, Dodson, and Zeiler[7] found that 0.5 c.c. of the quinine-urethane solution as used by Weekers was not fatal to rabbits weighing two kilograms, but that 0.7 c.c. caused death. In testing the slough-producing properties on the ears of rabbits it was found that sodium-salicylate and quinine-urethane solutions both produced larger and more persistent sloughs than sodium morrhuate. However, because of the greater potency of quinine urethane, in therapeutic doses it would have less tendency to produce sloughs than sodium salicylate. A solution of 0.5 c.c. of quinine urethane injected subcutaneously in the human leg produced no slough. This was confirmed by injections of similar

amounts in the writer himself. The quinine-urethane solution used was found to be bactericidal with staphylococcus aureus and was used without sterilization.

From the fact that the quinine-urethane solution had been used in ophthalmic therapeutics by previous investigators, that it possesses the property of obliterating vessels without being injected into the lumen, that it acts as an anesthetic after injection and is therefore less painful than sodium morrhuate, and that its sclerosing power is high in small amounts, further literature upon the application of this solution was investigated.

From a series of yet unreported experiments Kilbourne[8] stated in a personal communication that a one-percent solution of quinine with urethane produced only 17 percent of sloughs as compared with 56 percent with a one-percent solution of quinine with urea by the rabbit-ear method. If the quinine-urethane solution were allowed to age, the percentage of sloughs was reduced to zero. This would seem to indicate that some combination between the urethane and quinine occurred in the older solution.

By the application of quinine-and-urethane solution for the eradication of vascular tumors of the skin of both the cavernous and spider type, Andrews and Kelly[9] have reported the treatment of twenty patients. The solution consisting of four parts quinine, two parts urethane, and thirty parts water was diluted by them from one to six times according to the tolerance of the patient. They also used a 50 percent dextrose solution which gave about the same results as the quinine urethane. No attempt was made to inject the solution into a vessel, although this sometimes occurred. Hemostasis with a metal ring was advised during injection. Not more than 0.12 c.c. of the quinine-urethane solution was injected at any one point. There was some pain at the first injection, but none thereafter, and the injections were repeated at weekly intervals until the entire tumor was sclerosed. It is important to note that they obtained good results whether or not the solution were directly injected into a vessel.

So far the discussion has concerned itself only with the obliteration of varicose veins or vascular tumors with the sclerosing solution. The application of this solution for the obliteration of systic cavities was made by Kilbourne and Murray[10] who succeeded in curing hydrocele by injecting two to four cubic centimeter doses after aspiration of the hydrocele fluid. They found that this injection also acted as an anesthetic so that when the fluid reformed, a second injection of 3 to 10 c.c. of 13.66 percent quinine dihydrochloride, which has a greater sclerosing effect, could be used. Further injections were given at three-week intervals when necessary. Some patients so cured were observed for more than one year.

My attention was called to the possible use of sclerosing agents in ophthalmological therapeutics when a girl six years of age, who had a cyst in each lower fornix, came under my observation. There was a history of a bilateral streptococcus conjunctivitis in early infancy. Recovery was uneventful. At the age of three years the parents noticed a growth in the lower inner corner of the left eye. Shortly thereafter a similar but smaller tumor was noticed in the right eye. Examination of the child showed the visual acuity to be normal in both eyes with no pathological changes in either globe. There was some scarring of the conjunctiva in each lower fornix with the formation of pseudo-symblepharon. In the lower cul-de-sac of the right eye in its mid-portion there was a conjunctival cyst about one centimeter long and four millimeters in diameter (fig. 1). In the left eye a similar cyst extended from up behind the plica to beyond the mid-portion of the lower lid (fig. 2). This cyst showed two constrictions at its nasal end which might have been interpreted as the position of the valves in a dilated lymphatic.

Because no tissue was removed for pathological examination one could only speculate as to whether the origin of the cysts was from pockets of conjunctiva sealed off by the conjunctival inflammation as in the formation of a

Fig. 1 (Weymann). Case 1, right eye before treatment.

Fig. 2 (Weymann). Case 1, left eye before treatment.

Fig. 3 (Weymann). Case 1, right eye after treatment.

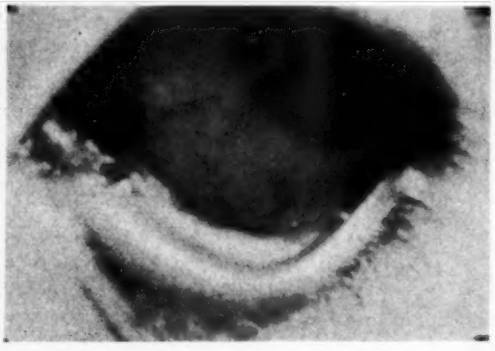

Fig. 4 (Weymann). Case 1, left eye after treatment.

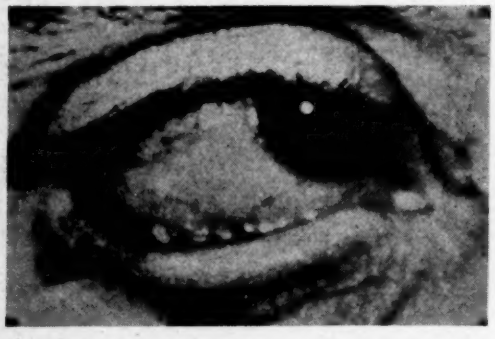

Fig. 5 (Weymann). Case 3, hemangioma before injection.

Fig. 6 (Weymann). Case 3, hemangioma four days after second injection.

pseudo-gland, or whether they were true lymphoceles. In any event they would be lined by a thin layer of cells, whether of an endothelial or epithelial nature would depend upon the origin. With the work of Kilbourne and Murray in the obliteration of hydrocele sacs in mind, and because the parents wished to avoid the use of a general anesthetic, it was decided to inject these cysts with quinine-urethane solution. Accordingly, on August 3 under cocaine-instillation anesthesia, two minims of a solution consisting of four parts quinine hydro-

chloride, two parts urethane, and thirty parts water were injected into the cyst in the right eye. The full-strength solution was used because it was thought that the contents of the cyst would dilute the solution about one half. There was immediate whitening of the collapsed cyst and a small amount of transient pain to the patient. The following day there was a moderate swelling of the lower lid, the cyst appearing porcelain gray. The lid was not painful. By August 7 the swelling had disappeared and the cyst seemed to be obliterated. On August 10, there was still some slight ecchymosis about the site of the needle puncture, but otherwise all signs of inflammation had cleared. On this date two minims of the same solution were injected into the cyst in the left eye but the solution did not diffuse into the entire cyst because of the constrictions previously mentioned. The patient complained only of a slight stinging pain. There was very little reaction on the following day. On September 7, that portion of the cyst which remained was injected with about one minim. At each injection there was some ecchymosis into the conjunctiva immediately following the penetration of the solution. On September 23, no trace of either cyst could be seen and photographs were made of the conjunctiva (figs. 3 and 14). On November 16, one lobule of the cyst in the left eye seemed to be recurring. One month later this showed further filling and was injected again with 0.1 c.c. of solution. It became chalky white after the injection and considerable hemorrhage occurred into the bulbar conjunctiva. On January 4, 1934, this cyst seemed entirely obliterated. This was almost six months after the first injection.

In short, the injection of one to two minims of full-strength quinine-urethane solution into these conjunctival cysts could be made with very little pain, the reaction was slight and subsided within a few days, and obliteration of the cysts followed the injection where the solution came into contact with the entire cystic cavity. As was found by Kilbourne and Murray, repeated injections were necessary in some instances completely to obliterate the cystic cavity.

On September 19, 1933, an infant eleven weeks of age was seen with a capillary hemangioma four by five millimeters in size just opposite the inner canthus of the left eye. A second small hemangioma, one-and-one-half millimeters in diameter, lay just temporal to the larger one. On September 28, 0.1 c.c. of a dilution of one to three of a solution consisting of four parts quinine hydrochloride, two parts urethane, and thirty parts water was injected into the main tumor mass. Immediate blanching occurred. The following day there was some discoloration of the center of the tumor mass with less elevation of the entire tumor. This shrinking continued until October 14, when it was noted that there was a mass giving a purplish shadow under the skin of the lower lid. This was interpreted as a continuation subcutaneously of the original growth. The mass on the surface of the skin also began to enlarge at this time, so that after consultation with a dermatologist carbon-dioxide snow was applied. Until December 5, five applications of carbon-dioxide snow were made, which seemed to have no effect in checking the growth of the mass in the lower lid. At this time 0.25 c.c. of full strength of the above quinine-urethane solution was injected into the middle of the growth in the lower lid. On the following day the lid was quite swollen with some ecchymosis. On December 26, the tumor mass in the lower lid was somewhat smaller and 0.2 c.c. of the same strength solution was injected into the cutaneous tumor at the inner canthus. After this the lids became swollen with some ecchymosis and when this reaction had subsided the tumor mass seemed more sclerotic and had shown no further growth. Because Professor Elschnig was in Los Angeles, on January 17, he was asked to see the patient. Surgical removal of the hemangioma was advised by him. Accordingly operation was done by Professor Elschnig at my request on January 23. At operation there was very little bleeding, for the tumor mass

seemed to be fairly well demarcated by sclerotic tissue. Professor Elschnig was of the opinion that the sclerosing injections had simplified the operative procedure by making the outline of the tumor more definite. Healing was uneventful. On April 28, 1934, there was no evidence of recurrence of the growth.

Histological examination of the tumor showed it to be of the capillary type.

This patient had a congenital hemangioma of the capillary type which was exhibiting rapid growth and was uncontrolled by the application of carbon-dioxide snow. The injection of quinine-urethane solution apparently stopped the growth of the tumor, and in the quantities injected produced a moderate inflammatory reaction with ecchymosis but no sloughing. It is possible that if a metal ring had been used to stop the circulation in the growth when the injections were being made, better results might have been obtained. It was my opinion and the opinion of Professor Elschnig at operation that the sclerosis produced by the injections had made the outlines of the tumor more distinct through the formation of scar tissue and facilitated its removal.

Lastly, a man fifty-eight years of age was treated, who had a congenital hemangioma of a triangular shape in the right lower lid. It involved the lid margin and conjunctival surface, but was not visible on the outer skin surface of the lid. There was no tendency toward increase in size, but because the five millimeters of lid margin involved was unsightly the patient desired the growth removed for cosmetic purposes.

Accordingly, on August 1, 1934, 0.1 c.c. of one-half strength quinine-urethane solution was injected into the hemangioma. During the injection hemostasis was produced with a chalazion clamp. This was removed at once after the injection. There was considerable immediate pain, which persisted as a dull ache for several days. The injected area remained anesthetic to touch for more than ten days. On August 20, partial sclerosis of the growth had occurred but considerable vascular tissue was still present. Therefore, 0.1 c.c. of the same solution was again injected, allowing the clamp to remain in place for about three minutes. There was less pain than from the former injection and the area remained blanched after the clamp was removed. On August 22, there was a small superficial slough along the lid margin at the site of injection. The reaction as to swelling was slight, as can be seen from the photograph made on August 24. Figure 5 shows the tumor as it appeared before injection, and figure 6 is a photograph taken four days after the second injection. Here almost complete obliteration of the growth was present along with some sloughing of the lid margin, which does not show well in the photograph. On September 7, the hemangioma appeared completely sclerosed but there was a slight indentation in the lid margin where the slough had occurred. This was not sufficient to cause any functional damage in the closing of the lid.

This case serves to illustrate the fact that a hemangioma of the lid may be obliterated completely with the quinine-urethane solution if sufficient hemostasis is maintained. It also shows that the dosage required for obliteration is close to that which will produce a damaging slough. Again it is emphasized that in the vicinity of the eye this solution must be handled in dilution and even then with the utmost care.

In ophthalmic therapeutics, small amounts of a sclerosing agent should be capable of producing marked effect attended with as little danger of inducing sloughs as possible. This was the reason for my selection of the quinine-urethane solution, along with the fact that it had previously been used for injection into the orbit by other writers without damage. It has the disadvantage of being toxic for those individuals who are sensitive to quinine, and of being so powerful that sloughing may occur if overdoses are used. In consideration of the possibility that a varicocele of the orbit might sometime be encountered, it was decided to test the effect of injecting this solution into the orbits of rabbits. Also an attempt was made to cause the formation of conjunctival cysts in rabbits which might

later be treated, but it was found impossible to produce such cysts by any of the methods tried.

As Kilbourne, Dodson, and Zeiler[7] had found that 0.5 c.c. of quinine-urethane solution could be injected into two-kilogram rabbits without being fatal, six rabbits of a group of twelve of more than this weight were injected with 0.5 c.c. of standard-strength quinine-urethane solution in the left orbit. On the following day the rabbits showed marked subconjunctival hemorrhage and conjunctival edema. In two rabbits the injection was mostly subconjunctival, and in one of these two days after injection, a keratitis occurred. Within two weeks after injection four of the six rabbits died, while all the controls were healthy. The dead animals were inadvertently destroyed by the caretaker so that no cause of death was determined.

Accordingly, on June 6, 0.2 c.c. of quinine urethane was injected into the right orbit of six albino rabbits. The injection was made in the lower temporal quadrant. The following day one rabbit was found dead with a marked protrusion of the globe, and edema and hemorrhage into the conjunctiva. Grossly the brain and intracranial portion of the optic nerve appeared normal. The globe showed marked petechial hemorrhages into the ciliary body. There was an infiltration of a polymorphonuclear type in the orbital fat with some edema. Two of the remaining five rabbits showed haziness of the cornea and congestion of the iris. All showed exophthalmos and ecchymosis of the conjunctiva.

Finally, one rabbit developed ulcerations of the cornea and another suffered with an active keratitis to the extent of complete functional destruction of the cornea. The third rabbit had a moderate degree of keratitis confined to the lower temporal quadrant. The fourth rabbit suffered a slough of the conjunctiva and orbital contents in the region of the injection but this healed without damage to the globe. The fifth remaining rabbit never showed at any time any involvement of the globe and recovered with a normal-appearing eye.

The same five living albino rabbits who had the injection of full strength solution in the right eye, with the addition of one extra rabbit to make six, were injected in the left orbit with 0.2 c.c. of a one-half dilution of the full-strength solution used above. The following day all showed some irritation of the conjunctiva and slight protopsis. Two days later only two rabbits showed any reaction, the eyes of the others appearing normal. These two showed some conjunctival swelling with engorgement of the iris vessels. One week later these eyes had also returned to normal, so that no permanent damage was caused to any eye by the intraorbital injection of the half-strength solution.

The results of these experiments would tend to show that the injection of a full strength of the above-mentioned quinine-urethane solution into the orbit is not to be undertaken lightly. Of course, one must consider that in the rabbit the amount of orbital tissue surrounding the eye is comparatively small, and that the sclera is much thinner than in the human eye. But of the living rabbits sixty percent suffered permanent damage to the globe from an injection of only 0.2 c.c. of full-strength solution.

I should therefore certainly hesitate to inject 1.5 c.c. of this solution into the human orbit as is reported by Weekers. From an analysis of his report one sees that he injected 2 c.c. of novacain prior to the injection of the quinine urethane solution. This, in my opinion, acted as a diluent for the quinine-urethane solution and thus saved him from having such a serious inflammatory reaction that damage to the globe might have resulted.

From a survey of what has been written, and my own experimental and clinical results, I would conclude that there is a definite but limited field in ophthalmic therapeutics for the use of sclerosing solutions as represented in this article by quinine and urethane. This solution should never be handled except with the utmost respect, and the patient should always be tested for his sensitivity to quinine before its use. The

standard solution of four parts quinine hydrochloride, two parts urethane, and thirty parts water should in all cases be diluted from one to four times in making the first injections to determine the reactivity of the individual. Superficial neoplasms of a vascular type may be treated without fear of damage if no more than 0.2 c.c. of solution is injected at any one time, and if sufficient interval is allowed between treatments to permit all reactions to subside. In treating such vascular growths it is advisable to produce stasis of the circulation by means of a metal ring surrounding the growth. If later operative removal of the growth is necessary, this may be facilitated by the encapsulation caused by the injection. Obliteration of cysts or lymphoceles of the conjunctiva may be obtained by the injection of this solution, but here again it should first be tried in a diluted strength, and never more than 0.2 c.c. injected at one time. Care should be exercised that the solution enter the cyst and not be injected subconjunctivally. If surgical removal of the cyst can be easily accomplished, I should advise that method of procedure rather than the injection.

The intraorbital injection of this solution into vascular tumors should be approached with the utmost caution. Undoubtedly the human orbital tissue will stand a fairly large dose without damage to the globe. But no harm will be accomplished if one first tries the smaller dose of 0.2 c.c. with a one-half strength dilution. Then, according to the reaction produced, further injections of increasing strength may be made until obliteration of the tumor has been obtained. In orbital tumors of a vascular nature for which no other method of treatment offers much chance of success with the conservation of vision, one is certainly justified in trying the injection of quinine urethane as above outlined.

To sum up the whole situation, one might say that in the sclerosing solutions we have another method of treatment which, if properly applied, may prove of value in treating some conditions which would not yield to other methods more readily. Where other and simpler therapeutic measures will suffice, the use of sclerosing solutions must be considered more dangerous, and not the method of choice.

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TEMPERATURE CHANGES IN THE CONJUNCTIVA IN RELATION TO APPLICATION OF HEAT AND COLD TO THE SKIN

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Dogs were used in experiments to determine the effect of changes in skin temperature on that of the conjunctiva. The latter was found to respond with changes similar to those in the skin, more marked after repeated applications of cold. These results would suggest a predisposition to bacterial invasion of the conjunctiva when the body is chilled and may account for the simultaneous involvement of conjunctiva and nose in acute coryza. From the Department of Bacteriology and Preventive Medicine, University of Illinois, College of Medicine, the Research Laboratories of the State Department of Public Health, and the Chicago Medical School.

Exposure to undue chilling has long been accepted as a predisposing factor not only to upper-respiratory and pulmonary infections, but also to bacterial invasion of practically every part of the body. While in the past this idea may have been almost entirely empirical, of late, careful experimentation and observation have elicited rather definite proof of this fact in regard to certain body tissues.

Mudd, Goldman, and Grant[1] have shown that with chilling of the skin there is a reflex vasoconstriction and lowering of temperature of the tonsils, palate, and pharynx. Spiesman[2] found that a 4-cm. ice cup, applied to the skin, caused a vasoconstriction and lowering of temperature of the nasal mucosa. Cohnheim and Roy[3], Frank Francois[4], Strasser and Wolf[5], Werthheimer[6] and others have shown that application of cold to the skin results in an accompanying lowering of the temperature of the kidney. Nedzel[7, 8, 9] has shown that the temperature of the trachea and kidney follows that of the skin. He[8] also showed that the temperature of the normal kidney follows that of the skin whereas the temperature of the denervated kidney follows that of the blood in the abdominal aorta.

Because of the importance of lowered tissue resistance as a factor in facilitating bacterial invasion and because cold is one important cause of such lowered resistance, the following study was made to see if chilling of the skin would influence the conjunctiva in the manner in which it evidently influences other body tissues.

Experiments

For the temperature readings of the conjunctiva, a Queen potentiometer was employed. Three thermocouples were used. Each thermocouple was composed of two wires, one of copper and the other of German silver. The ends of the thermocouples were coated with shellac and embedded in celloidin.

Five dogs were used for experimentation: three served for three experiments each, and two for two experiments each (a total of 13 experiments).

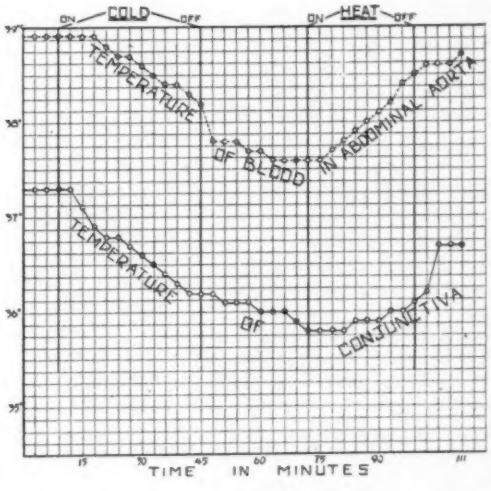

Chart 1

The dogs were placed under nembutol anesthesia. The left femoral artery and vein were isolated in each case. Heparin was injected into the femoral vein (0.01 gm. per kilogram of weight) to prevent the clotting of blood. The femoral artery was opened and a special, long glass centigrade thermometer was introduced through it into the abdominal aorta. The three thermocouples were placed in the conjunctival sac so that

as nearly as possible one was at the outer third, one at the middle third, and one at the inner third. The lids were brought together by clamping the hair on the skin surface in order not to traumatize the mucocutaneous junctions.

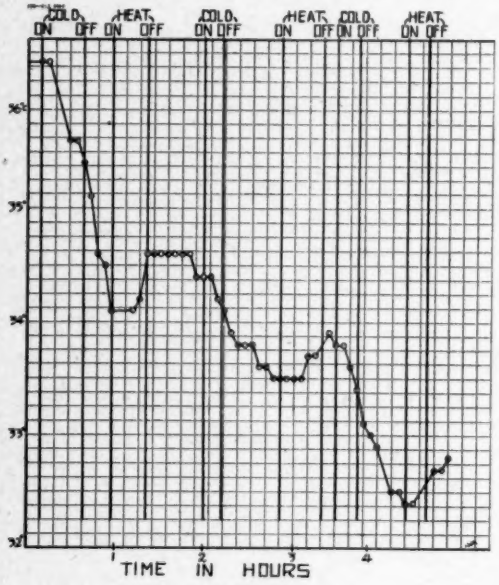

Chart 2

Ice bags and hot water bags were alternately applied to the shaved skin of the dogs' chests.

The results are shown on Chart 1 which is an average of the thirteen experiments. The abscissae represent the time of experimentation and the ordinates the centigrade temperature. The dotted line represents the temperature of the abdominal aorta and the straight line the temperature of the conjunctiva. The perpendicular lines indicate the time of application of heat and cold. From the chart it can be seen that the temperature of the conjunctiva follows that of the skin. When ice is applied, the temperature of the conjunctiva drops sooner than that of the abdominal aorta. When heat is applied after previous chilling, the conjunctiva responds more slowly than the blood of the aorta. Also, whereas in the same period of heating the blood of the aorta returns to within two tenths of a degree of the original temperature, the conjunctiva returns to within only six tenths of a degree of its original temperature. This latter fact correlates rather nicely with Spiesman's[9] observation, that after the initial drop of the temperature of the nasal mucosa following chilling of the skin, these membranes failed to regain their original temperature by 0.18 to 0.36°C.

Chart 2 was compiled to show the effect of repeated chilling on the temperature of the conjunctiva. Here are shown three continuous experiments on one dog. It is seen that after three chillings, although heat was applied between, the curve is steadily downward with a final drop of 3.5°C. from the time of the beginning of the experiment.

The above findings show the existence of a vasomotor reflex between the skin and the conjunctiva. This is manifested during exposure to cold by vasoconstriction and lowering of temperature, and to heat by vasodilatation and a rise in temperature. This reflex seems more sensitive to cold than to heat. Vasoconstriction causes increased permeability of blood vessels, abetting the passage of bacteria circulating in the blood through the vessel walls into the surrounding tissues. This has been shown by Hoff[10] and by Landis[11]. Okuneff[12] injected trypan-blue subcutaneously into the rabbit and found that a previous injection of adrenalin with its vasoconstrictive action resulted in a delayed absorption of the dye. If we may draw an analogy from this experiment of Okuneff, then vasoconstriction should result in decreased absorption of bacteria from the invaded tissue. Therefore, disturbances of the blood supply of the conjunctiva, as a result of exposure of the body to cold, should favor the action of bacteria in that region. Repeated exposure to cold should facilitate to an even greater degree this bacterial activity.

Conclusions

1. Chilling of the skin results in a reflex lowering of the temperature of the conjunctiva.

2. This response is markedly exaggerated after repeated applications of cold.

3. Chilling of the skin with the asso-

ciated lowering of the temperature of the conjunctiva should predispose to conjunctivitis.

4. The conjunctiva responds to chilling of the skin in the same manner as does the upper respiratory tract.

5. The similarity of the reflex response of the conjunctiva and of the mucous membrane of the nose to chilling of the skin may explain the simultaneous involvement of conjunctiva and nose in acute coryza.

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TRANSIENT FLUCTUATIONS IN THE SCOTOMA OF GLAUCOMA

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A carefully controlled study of 143 cases of glaucoma simplex is made. Graphs of scotoma area are shown with graphs of tension and visual acuity. When the presented technic is used, the scotoma graphs show more minute variations of the condition than by other means. A special study of diurnal changes in scotoma area is shown together with evidence of the influence of morning coffee. Early morning studies of patients, the subjects of glaucoma, are advocated. Read before the Section on Ophthalmology, New York Academy of Medicine, on November 19, 1934.

By way of introducing the material of this study, I wish to quote Duke-Elder: "Primary glaucoma is a heterogeneous clinical entity."[1] His paper deals with "A possible mechanism of a vascular crisis in the eye, such as might result clinically in acute glaucoma." The present study deals primarily with but one aspect of the entity—the clinical correlation of visual acuity, tension, and the central field defects.

With the old axiom in mind "To know, one has to measure," it seems desirable to state the scotoma change in units of some sort, so as to follow variations relative to those of visual acuity and tension. Quantitative statement of the scotoma thus becomes the crux of this report.

Schedule, Material, Method

The study was begun with the assumption that factors known to produce variations in the intraocular pressure might be considered as possibly modifying the scotoma. It is thus obvious that the following variables had to be considered in each case*.

1. Time of day when study was made. In view of the diurnal variation of intraocular pressure, one must have some idea as to how near the peak or trough of the pressure curve the particular study is made. The scotoma, tension, and vision, taken in the early morning, could not be fairly compared with the data derived from a like study taken in the late afternoon.

2. Relation to catharsis. Since saline cathartics (hypertonic solutions) may have a decided influence on intraocular pressure, one must be sure he is not misled by the influence of such an agent, the effect of which might produce transient changes.

* From a purely scientific viewpoint, there are doubtless other variables which should be included, as climate changes, season, pH of medication, etc.

3. Relation to ingestion of coffee. The caffeine test, while hardly established on a clinical basis, must be considered as a possible variant. The true relation of the data to the "morning coffee" should be considered.

4. Care must be taken to eliminate **possible influence of the barbitals** as it is said[2] that this group of medicaments modifies capillary permeability*.

5. Nervous excitement and physical exertion are known to modify intraocular pressure. It is for this reason that such influences must be minimized during or near the time of examination. Moreover there is some evidence, though meager, that the scotoma even of nonglaucomatous subjects may be modified[3].

6. Those factors which modify **"physiologic retinal edema"** must be considered. These are numerous and have been described in detail elsewhere[4]. To be emphasied here are:

7. Presence or absence of menstruation,

8. General fatigue, and

9. Relative variations in blood pressure.

10. As to posture, one should not compare too closely a study made when the patient is sitting upright, with one made when the patient is recumbent (an office study as compared with one when the patient is in bed in the hospital).

11. Constriction of clothing must be guarded against[5], particularly about the neck, and measurements should not be taken immediately after a coughing spell.

12. Pupillary size. Variations in the size of the pupil are productive of field changes, and the exaggerated variations from the myotic action of pilocarpine and eserine may reduce not only intraocular pressure but also the amount of light entering the eye, and the stenopeic effect may improve visual acuity**. One must not forget that these drugs have definite influence on circulation *per se*.

In some instances, decrease in the size of the pupil was associated with improvement in visual acuity; in others, with decrease in visual acuity. In a number of instances when pupils remained the same in diameter, one eye showed increased acuity, the other decreased acuity. In other instances, the pupils remaining constant showed quite a variation of acuity. Other relations will become obvious if the data be compared.

13. Relation to use of tobacco. While it may be generally conceded that intraocular pressure is probably influenced by nicotine (experimental), the use of tobacco, as far as I know, has not been directly related to the clinical entity of glaucoma; nevertheless, in making

* Parenthetically it might be well to point out that in a recent communication on the pharmacological effect of the barbitals, the following statement was made: "Vasodilatation of the peripheral circulation is produced, resulting in flushing (Lindemann, E. Am. Jour. Psychiat., 1932, May, v. 11, p. 1083) and, in some cases, in cyanosis [(a) Lundy, J. S. Anesth. & Analg., 1930, Sept.-Oct., v. 9, p. 210; (b) Zerfas, L. G., and McCallum, J. T. C. Ibid., 1929, Nov.-Dec., v. 8, p. 349]. There is also a resultant decrease in the tonus of the heart muscle (Ni-itsu, S. Sei-I-Kwai Med. Jour., 1931, Sept., v. 50, p. 1). The permeability of the endothelium of the capillaries is altered (Marx, H. Jour. Pharmacol. & Exper. Therap., 1931, April, v. 41, p. 483), and water is directed toward the tissues of the body." The fact that some drugs, notably cinchophen, may act by increasing the electrical potential of the body tissues (abstract by Adler. Arch. of Ophth., 1933, July, v. 10, no. 1, p. 121) rather than by increasing capillary permeability, must be kept in mind.

If this is so, we should ask ourselves if we should not avoid the barbitals such as luminal, pyramidon, etc., for patients, the subjects of glaucoma, who are suffering from ocular or other pain. Until specific data have appeared, it might be well to accept the principle that more fluid passing through the vessel wall—due to the action of these drugs—will increase the amount of fluid in the vitreous and hence cause a greater elevation of the pressure. We should recall moreover that it is wise to study the blood picture occasionally if the drug is given over a period of time, in view of the recent reports indicating severe granulopenia following the use of barbiturates and amidopyrine[6].

** A study of the relation of pupil size to visual acuity in this group of patients, while not as complete as might be desired, is very instructive as will be noted from a careful study of the last column in table 1.

these studies it was thought best to eliminate its possible influence through variation in its use. The subjects were instructed not to modify their habits previous to the study on the day of examination. In only two cases in the series was there addiction to the use of tobacco.

14. The presence of general disease, which might be a factor in the production of variations of intraocular pressure, scotoma, or visual acuity, must obviously be considered, as even the earliest workers had called attention to the fact that vascular disease in particular could produce defects quite similar to those associated with glaucoma[6, 7, 8, 9]. A number of cases of diabetes were omitted because of the possible effect of variation of the index of refraction, etc. The cases reported in this paper were carefully studied by internists.

15. Relation to myotics. (See also no. 12 on pupillary size).

It is obvious that one must make note not only of (a) the nature of the myotic used; but (b) the frequency of instillation; (c) the dosage, and (d) the period over which it has been used; also (e) the time elapsed between the last instillation and the examination.

16. Complete ophthalmological study in each case was essential to rule out the possibility of a secondary glaucoma and other pathological processes. To this end careful study was made which included in each case (a) an examination with the slitlamp corneal microscope, and (b) numerous peripheral-field studies.

Sometimes a low-grade cyclitis became evident years after a diagnosis of simple glaucoma had been made, and in a number of cases the development of lens changes nullified the comparative value of previous central-field studies and made questionable the type of glaucoma. Such material was discarded. A number of subjects were omitted from the study because there was an indeterminate amount of circulatory insufficiency which of itself was very labile.

Standardization of all these factors, while not perfectly controllable, is perhaps less difficult than at first appears. Reserving an early appointment hour for patients, the subjects of glaucoma, not only gives the advantage of studying the conditions when pressure is nearest its maximum, but it prevents the use of a cathartic that morning, fixes the time of ingestion of coffee, the use of myotics, etc.

The area of the scotoma

As the material herein presented accumulated, it soon became plain that an analysis of the evidence could not be made unless some appropriate method was devised to state numerically the scotoma changes. To this end it seemed advisable to ascertain the area of the defect by some form of planimetry*. Since the area of projected retina studied on the stereocampimeter represented but a small portion of the whole field, one could not state the result in terms of percentages of field losses. It was therefore decided to select a limited area of the campimeter chart—an area to which the classical defects are for the most part limited, and an area as free from the "scotomata of physiologic edema" as possible. To this end, a "window" was cut in a black campimeter chart and superimposed upon the map to be measured. The area of the defect appearing within this window alone was to be gauged. The "window" was so arranged that its nasal edge passed through the fixation point, its upper edge coincided with the 15° line, its temporal edge with the 25° line, and its lower edge with the 15° line.

The Universal Map Measure** (Keuffel & Esser Co., New York, No. 1692) was used in the following way. The wheel of the instrument was caused to trace the 1° vertical markings on the chart over those regions of the scotoma

* The writer is cognizant of the fact that others have made quantitative statements of visual-field defects.

** A device called a planimeter is available, which enables one to determine the area of an irregularly shaped surface, but such a device is too expensive to find a place in clinical scotometry. In the hope that the evolution of a practical method might be established, the following device and technic were evolved.

included within the limits of the "window." In other words, vertical measurements were made of the scotoma every 1° of its surface. The meter records in centimeters and fractions. No effort was made to express the results in centimeters of area since the object of the study was merely to arrive at an understanding of the relative variations in the size of the defects*.

Moreover, the resulting figures were adaptable to the same graph paper as that used for plotting tension and visual acuity**. The figures thus derived, while amply accurate for the present purpose, must not be accepted as minutely precise. In a number of instances, it was necessary to extend the area of a scotoma to fill in the prescribed rectangle. In no instance, however, was this necessary if the scotoma was of pathological dimensions, as it has been the practice to map defects until well beyond the present limits of the "window" or until they had outlined 1° or less in width (the width of the "normal" angioscotoma).

It must be pointed out that whereas variations of scotoma size for one patient are comparable with the visual acuity and tonometric readings, they are not comparable with those of other patients in every instance. Any comparison is a very broad one because of the great variability of individual responses.

Technics of examination

The form of technic for this sort of examination must be so chosen as to attain the optimum results and yet not depart radically from the usual clinical procedures. By reserving the earliest morning appointment of the office hours for the examination of glaucoma cases, standard conditions are more easily attained as already implied. The patients rested a few minutes after reaching the office—a period which was insured by those short delays incident to the beginning a day. The first examination made was that of determining visual acuity. The Bausch & Lomb Ives chart was used. This maintained a standard "daylight illumination" which, by actual measurement of the chart used with the General Electric footcandle meter showed 5 ft-c. The test letters (interval of green) were white on a black blackground and had a range as far as 6/3.

The actual letters were those which were recommended by the Committee on Standardization of Test Charts for Visual Acuity for the American Medical Association (1916)[10]. The eye not under test was covered by an obturator which could not press against the eyeball. Unless otherwise stated, all tests were made without correcting lens, as in some instances the eyeglass frame would not fit into the stereocampimeter shield rest. (One might think that it would be advisable in studies of this character to make special effort to maintain the correction of the error of refraction as perfectly as possible. However, it has been found that as high as a plus-10 sphere placed before a normal eye did not seem to distort the size and proportions of eccentrically placed defects unless they were more than 15 or 20 degrees toward the periphery. The fixation point would doubtless be obscured in some instances were it not for the fact that the writer used a white chalk dot for fixation.) After obtaining the record of visual acuity, the scotoma was next mapped by the technic outlined in earlier communications for the plotting of angioscotomata[11]. It is important, however, to emphasize the following: the stereocampimeter and Lloyd slate were used with artificial

* It is obvious that the reading as indicated by the map measure, when used in the manner above described, could not be stated as representing centimeters of area. Since the method has a possible application to the measurement of any scotoma, we have coined the term "scotoma unit" for our reading.

If vertical measurements (in centimeters) of a scotoma are made at 1° intervals, their sum may be stated as "scotoma units." A scotoma unit would thus be a variable which would bear a relation to the fixation distance (projection of 1° upon a tangent surface).

** Semi-Logarithmic paper No. 340-L110, made by Eugene Dietzgen Co., Chicago and New York.

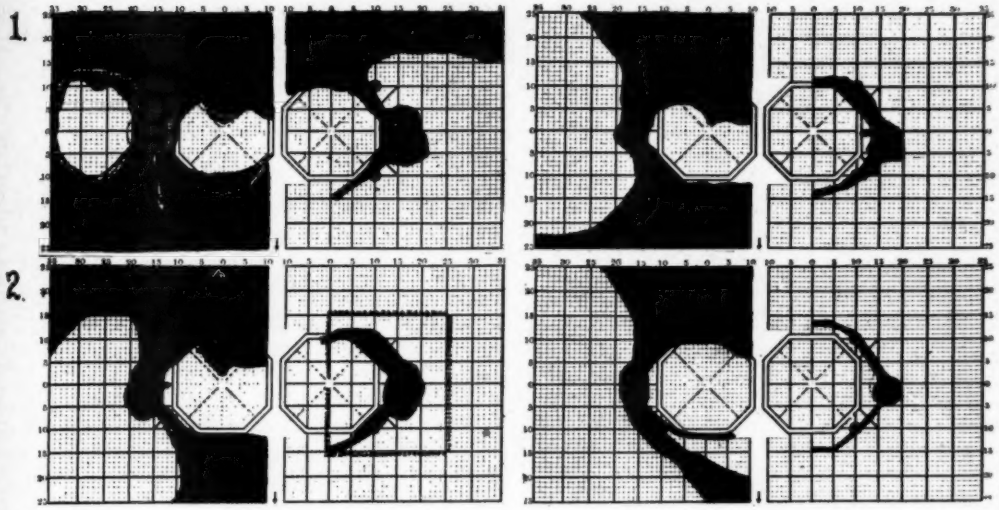

Fig. 1 (Evans). Depicting the field measurements in a case of glaucoma, together with the current history. Chart 1 was made at first visit; chart 2 at second, etc. The area within the dotted line on chart 2 represents the "window" described in the text.

D.B. (Male) 58 years.
Complaint—Blurry vision, A.M.
1st Visit—September 8, 1933.
(1st Exam.) 9 A.M.
No coffee. No catharsis.
Blood pressure: 132/85
Tension (McL.): O.D. 28; O.S. 51
Vision: O.D. 6/4-2; O.S. 6/6-2
No pilocarpine
Cardiac lesion (compensating)
Dishy nerves, more O.S.
O.S. cupped above.
Slitlamp: No changes.
Pupils: O.D. 6 mm.; O.S. 7 mm.
OBJ. .54 mm.
190 mm.

(2nd Exam.—Dotted Line)—9:55 A.M.
Following 1 m. 1% eserine.
Blood pressure: 132/80
Tension (McL.): O.D. 22; O.S. 32
Vision: O.D. 6/6-3; O.S. 6/4-1
Pupils: O.D. 1.5 mm.; O.S. 1.5 mm.
OBJ. .54 mm.
190 mm.

2nd Visit—September 21, 1933.
8:50 A.M.
No coffee. No catharsis.
Blood pressure: 138/80
Tension (McL.): O.D. 25; O.S. 43
Vision: O.D. 6/4-3; O.S. 6/4
On pilocarpine for 13 days:
1 m. 1% O.S. t.i.d.
1 m. .5% O.D. t.i.d.
Last drop 12 hours ago.
Pupils: O.D. 4.5 mm.; O.S. 4.0 mm.
OBJ. .54 mm.
190 mm.

3rd Visit—September 28, 1933.
9 A.M.
No coffee. No catharsis.
Blood pressure: 142/85
Tension (McL.): O.D. 22; O.S. 28
Vision: O.D. 6/4 slow: O.S. 6/4
On pilocarpine for 20 days:
1 m. 1% O.S. t.i.d.
1 m. .5% O.D. t.i.d.
Last drop 3 hours ago.
Pupils: O.D. 3.5 mm.; O.S. 3.0 mm.
OBJ. .54 mm.
190 mm.

4th Visit—December 14, 1933.
8:50 A.M.
No coffee. No catharsis.
Blood pressure: 142/85
Tension (McL.): O.D. 24; O.S. 30
Vision: O.D. 6/4; O.S. 6/3
On pilocarpine for 77 days:
1 m. 1% O.S. t.i.d.
1 m. .5% O.D. t.i.d.
Last drop 2 hours ago.
Pupils: O.D. 2.5 mm.; O.S. 2.0 mm.
OBJ. .54 mm.
190 mm.

daylight illumination of 15 foot-candles as indicated by measurements taken with the General Electric foot-candle meter. The minute, silver-sphere objects, varying in size from .25 mm. to 1.50 mm. (in ¼-mm. steps,—the fixation distance of the instrument is 190 mm.), were employed. Mapping was made always at right angles to the supposed course of the defect, by moving the object from the seeing to the nonseeing region.

Tonometry

Tonometric measurements were made following the instillation of one drop of 2-percent butyn and of a second drop of 2 percent butyn when the stinging sensation of the first drop had subsided, with a single application of the McLean tonometer. A single application was employed rather than an average of three in order to avoid the possible decrease in tension incident to repeated pressure on the globe. This plan was advised by Elliot in his work on glaucoma[12]. A reclining position was avoided, the patient leaning back in the chair and tipping the head until the visual line could be directed perpendicularly. A fixation object was provided. The vertex of the head rested against the wall, thus supporting the head without muscular exertion on the part of the patient. The reclining position was avoided in order to reduce as much as possible the influence of posture on tension as well as scotoma, a particularly important factor in those cases with relatively low systolic blood pressure[4]. The short period of time necessary to take a single reading, particularly on patients accustomed to the procedure, probably minimizes the influence of head position on intraocular pressure. Special precautions, of course were taken to see that there were no constrictions of the neck by clothing or chair-back, etc.

Peripheral-visual-field studies were made at sufficiently frequent intervals in each case to enable judgment on the progress of peripheral defects. The Ferree-Rand instrument was used with the spotlight object as elsewhere described[13]. The fields were mapped with three sizes of object in most instances, and when less than three sizes of object were used, that size was selected which had shown the most productive results at previous examinations. The technic, as permitted by this combination of perimeter and object, allowed the plotting of a satisfactory peripheral field in six to ten minutes for each eye, hence reducing the likelihood of general fatigue and inattention. The field for white alone was studied.

The pupillary size was measured with a standard form of keratometer (Ruka), precautions being taken to see that lighting conditions were the same at each test.

Ophthalmoscopy

Ophthalmoscopy was postponed until all other examinations had been completed on account of the influence which light is known to have on intraocular pressure[14] and on the scotoma[3]. Both direct and indirect methods were employed.

No plan has been found practical which would enable the accurate measuring or plotting of minute degrees of excavation of the nervehead. Estimations with a slitophthalmoscope (model of the author not yet described in the literature) were made in a few instances (not considered helpful in this study).

Material

Much of this material was begun three to five years before this study was planned; hence certain data were lacking. The material for this study was gathered from the records of about 9,000 private patients of whom 130 had glaucoma simplex. Twelve cases were selected from this group to supply material of sufficient detail and dependability for useful data. These 12 cases represent 143 separate studies.

The first step in the analysis of this material was to divide the studies into two groups. Group 1 contained the minutely controlled material and is presented in table 1. This provided data of secondary influences which might modify the effect in such a way as to obscure accurate interpretation. It then

became possible to accept with reasonable assurance the data as set down in table 2. Table 2 includes cases selected from table 1 and also studies which lacked full data (corresponding to headings of table 1) for certain visits; for instance, when the study was first started, blood pressure was occasionally omitted, pupillary measurements were not regularly taken, and the time of visits varied by an hour. All other data were the same as those shown in table 1.

Discussion

One interested in making a detailed analysis of the material will find it necessary to study the tables minutely; but the graphs as indicated in figure 1 will perhaps serve better to elucidate the relation of scotoma, tension, and vision, at least so far as the early cases are concerned. It will be observed that whereas the area of the scotoma increased as the tension rose and the vision decreased, this is not an absolutely constant relation, but the difference can be explained in a number of instances by referring to special data as set down in the tables. Nevertheless there still remain occasions on which the rise and fall of the graph do not match. Various explanations might be offered for this dissociation, the first of which may have its basis in our methods. In the first place, it is probable that greater refinements in the methods of measuring visual acuity—so that the minute variations could be recognized—would give a visual-acuity curve of a quite different character from that appearing in this study. Next, we must appreciate that though the tonometer is far superior to the palpatory method of estimating tension, it is at best a very crude instrument, the final readings of which are, after all, a measure of ocular tone* and not a measure of intraocular pressure. Moreover, the tonometer indicates the conditions as they exist under very artificial circumstances and for a very short period of time. This is more apparent when we realize that the true manometric curve is composed of three increments. The main wave of actual intraocular pressure has superimposed upon it a respiratory curve, and upon this is superimposed the pulse curve. Irregular variations of this complex curve doubtless arise from the influence of the recti muscles, orbicularis, etc.

As regards the scotoma itself, one must have some sort of hypothetical foundation to explain its variations. The hypothesis which the writer has offered[15, 16, 17], while doubtless very defective and incomplete, seems to be the only suitable one thus far presented. It will be recalled that this hypothesis postulates a perivascular-space mechanism which accounts for the increase and decrease in the size of the scotoma, whether the primary influence has its origin from the vitreous-tissue side or from the blood-vessel side of the space. With this idea in mind, then, one can understand how it might be possible for the tonometer to show a relatively abrupt drop in pressure though the scotoma curve had not as yet caught up with it, due to the fact that the perivascular-space mechanism had not completed retinal drainage (reference to the original-interpretation data will make obvious a number of possibilities for this retarded fluid movement[15]). Besides these understandable discrepancies there are doubtless others which will be disclosed as further data are available and as more material accumulates. After all, 143 studies constitute a relatively scant material.

Keeping in mind the opening paragraph of this paper, it would appear from a study of the graphs in figure 2, that glaucoma might not only be considered a complex series of events leading up to some sort of vascular crisis, but that this crisis is preceded by a series of anticrises or precrises or minor crises (the writer thinks it would be helpful to refer to one of these events as a minor crisis and to the fully established, acute attack as a major crisis). It is essential that we know, in studying the table, the occasions when a myotic was used (as indicated by the black square at the bottom of the

* The word "tone" is used in a broad sense and is meant to include not only the internal pressure of the eye itself but the resiliency of the tissue, etc.

Table 1

DATA ON CLOSELY CONTROLLED GROUP

Name	Date	Age	Sex	Time	Blood Pressure	Coffee at	Slitlamp	Fundus	Vision		Tension (McL.)		Area of Scotoma		Size of Object	Continuous Treatment		Off Pilo. (Last Drop) for	General Physical	Remarks
									O.D.	O.S.	O.D.	O.S.	O.D.	O.S.		On Pilo. for	Dose			
Case I																				
S.C.M.	10/23/28	41	F.	8:30 a.m.	125/80	7:30 a.m.	No change	Dishy nerveheads; wide light streaks	6/6+4	6/6	27	35	73.5	63.0	1.00/190 mm.			yes	Cardio-renal vascular disease	Achy O.S. with spells of nausea
	11/ 3/28			8:30 a.m.	130/80	7:30 a.m.			6/6−3	6/4	22	19	87.0	75.5	1.00/190 mm.		1 m. .1% O.U. t.i.d.	7 da.		Used .1% pilo. O.U. at irregular intervals for a few days at a time to relieve symptoms
	2/16/29			8:30 a.m.	132/80	7:30 a.m.			6/7+2	6/4−3	22	27	121.0	68.0	1.00/190 mm.			92 da.		
	2/21/29			8:30 a.m.	125/85	7:30 a.m.			6/7+3	6/4−3	22	42	88.0	93.0	1.00/190 mm.			97 da.		No menstrual periods since Jan. 16, 1932
	3/23/29			8:30 a.m.	130/80	7:30 a.m.			6/7−2	6/4−1	26	24	75.0	62.0	1.00/190 mm.			1 hr.		
Case II																				
S.L.M.	3/25/33	40	F.	4:15 p.m.	122/80	7:30 a.m.	O.U. No changes	All vessels dip	6/4	6/4−2	27	28	73.5	92.5	0.47/190 mm.			yes	Varicose veins	Achy O.S. and slightly enlarged pupil. Occasional blurry vision in the morning. Note difference in time of day
	3/27/33			9:30 a.m.	110/82	7:30 a.m.			6/4−3	6/4	23	24	32.0	37.0	0.47/190 mm.	18 hr.	1 m. .25% O.U. t.i.d.	2 hr.		
	4/18/33			10:00 a.m.	120/85	7:30 a.m.			6/4	6/4−4	31	28	58.0	48.0	0.47/190 mm.			15 da.		
Case III																				
H.B.G.	8/ 1/32	36	M.	10:45 a.m.	120/80	7:30 a.m.	No changes	No apparent abnormality	6/6−1	6/6	28	22	46.5	53.5	0.51/190 mm.	2 yr.	1 m. .25% O.U. t.i.d.	24 hr.	Chronic cholecystitis	Been treated by another ophthalmologist
	9/27/32			8:45 a.m.	120/80	7:30 a.m.			6/6	6/6	27	20	29.5	32.5	0.51/190 mm.			57 da.		
	12/15/32			8:45 a.m.	115/80	7:30 a.m.			6/4−4	6/4−3	32	28	36.5	41.0	0.51/190 mm.			79 da.		Usually drinks a cup of coffee at 7:30 a.m., 10:30 a.m., and occasionally in evening
	1/31/33			8:45 a.m.	110/80	7:30 a.m.			6/4−3	6/4−2	24	24	60.0	34.0	0.51/190 mm.	47 da.	1 m. .25% O.U. t.i.d.	1 hr.		
	6/ 2/33			8:45 a.m.	120/87	7:30 a.m.			6/4	6/4	26	21	25.5	34.0	0.51/190 mm.	122 da.	1 m. .25% O.U. t.i.d.	1 hr.		
	2/24/34			8:45 a.m.	120/85	7:30 a.m.			6/4−3	6/4−2	25	22	46.0	59.0	0.54/190 mm.	267 da.	1 m. .25% O.U. t.i.d.	2 hr.		
Case IV																				
M.E.S.	1/15/29	42	F.	10:00 a.m.	120/85	8:00 a.m.	No dilated vessels; no deposits; no pigment; no corneal edema	Dishy nerveheads and wide light streaks (irregular)	6/7	6/7	22	24	20.0	23.0	0.50/190 mm.			yes	Moderate arteriosclerosis	Spells of blurry vision and achy eyes at various times
	10/24/33			11:30 a.m.	155/95	8:00 a.m.			6/12	6/7−2	39	35	46.0	38.5	0.50/190 mm.			yes		Pupils 3.0 mm. O.U.
	10/31/33			10:00 a.m.	130/85	8:00 a.m.			6/12	6/7	34	30	67.5	50.0	0.50/190 mm.			yes		Pupils 2.0 mm. O.U.
	10/31/33			10:35a.m.[1]	132/90	8:00 a.m.			6/6−1	6/6+4	32	24	29.0	31.0	0.50/190 mm.			35 min.		
Case V																				
A.G.	5/19/32	35	M.	12:00 m.	112/85	8:00 a.m.	Scattered point opacities in lens	Peripheral atrophic choroiditis (slight)	—	6/4−3	—	38	—	69.0	0.51/190 mm.			yes	No findings; very complete study	No complaint; routine examination
	11/25/33			1:00 p.m.	118/90	8:00 a.m.			—	6/6−2	—	50	—	122.0	0.50/190 mm.			yes		Spells of blurry vision in the morning
	11/27/33			1:00 p.m.	115/95	7:30 a.m.			—	6/4−2	—	36	—	94.0	0.50/190 mm.	2 da.	1 m. .25% O.S. t.i.d.	5½ hrs.		Pupil 1.5 mm. O.S.
	12/11/33			9:00 a.m.	120/95	7:30 a.m.			—	6/15	—	35	—	79.0	0.50/190 mm.	16 da.	1 m. .25% O.S. t.i.d.	1½ hrs.		Pupil 1.5 mm. O.S.
	1/22/34			9:30 a.m.	125/95	7:30 a.m.			—	6/15−3	—	34	—	78.0	0.50/190 mm.	58 da.	2 m. 1.% O.S. t.i.d.	2½ hrs.		Pupil 1.5 mm. O.S.
	1/30/34			9:25 a.m.	112/85	7:30 a.m.			—	6/15−2	—	23	—	49.0	0.50/190 mm.	64 da.	2 m. 1.% O.S. t.i.d.	2½ hrs.		Pupil 1.25 mm. O.S.
	2/ 6/34			9:25 a.m.	112/90	7:30 a.m.			—	6/60	—	28	—	59.0	0.50/190 mm.	71 da.	2 m. 1.% O.S. b.i.d.	2 hrs.		Pupil 6.0 mm. O.S.
	2/16/34			9:25 a.m.	120/85	7:30 a.m.			—	6/4	—	39	—	59.5	0.50/190 mm.	77 da.	2 m. 1.% O.S. b.i.d.	4 das.		

Case VI A.B.	3/27/33	47	F.	11:30 a.m.	128/90	8:00 a.m. (Sanka)	No changes	Well-established cupping O.U.; more O.S.	6/6+3	6/4	45	50	90.0	134.0	0.86/190 mm.			yes	Focal Infections. Moderate arteriosclerosis. Not menstruating	Headaches; not referable to eyes
																				Pupils:
	3/31/33			10:15 a.m.	130/90	8:00 a.m.			6/6	6/6−2	32	35	68.0	67.5	0.86/190 mm.	4 da.	1 m. .25% O.U. t.i.d.	2 hrs.		O.D. 3.0 mm.; O.S. 4.0 mm.
	4/11/33			9:30 a.m	132/90	7:45 a.m.			6/4−1	6/4−1	31	28	44.0	97.0	0.86/190 mm.	15 da.	1 m. .5% O.U. t.i.d.	2 hrs.		O.D. 3.0 mm.; O.S. 4.0 mm.
	10/ 5/33			9:50 a.m.	142/100	7:45 a.m.			6/6	6/6−1	31	36	66.5	123.5	0.86/190 mm.	192 da.	1 m. .5% O.U. t.i.d.	2½ hrs.		O.D. 2.5 mm.; O.S. 3.0 mm.
	11/ 2/33			10:00 a.m.	124/90	7:45 a.m.			6/4	6/4	39	41	121.5	125.0	0.86/190 mm.	220 da.	1 m. 1.% O.U. t.i.d.	2 hrs.		O.D. 1.5 mm.; O.S. 1.5 mm.
	11/ 2/33			11:10a.m.[2]	118/90	7:45 a.m.			6/60	6/60+2	28	32	79.0	112.0	0.86/190 mm.	220 da.		3 hrs.		
Case VII D.B.	9/ 8/33	58	M.	9:00 a.m.	132/85	None	No changes	Dishy nerves; more O.S. O.S. cupped above	6/4−2	6/4−2	28	51	63.0	164.5	0.54/190 mm.			yes	(Compensating) cardiac lesion	Blurring of gunsites only
	9/ 8/33			9:55a.m.[4]	132/80	None			6/6−3*	6/4−1	22	32	34.5	115.0	0.54/190 mm.			yes		
	9/21/33			8:50 a.m.	138/80	None			6/4−3	6/4	25	43	56.5	111.0	0.54/190 mm.	13 da.	1 m. .5% O.D. t.i.d. 1 m. 1.% O.S. t.i.d.	12 hrs.		Pupils: O.D. 6.0 mm.; O.S. 7 0 mm.
	9/28/33			9:00 a.m.	142/85	None			6/4	6/4	22	28	48.5	135.5	0.54/190 mm.	20 da.	1 m. .5% O.D. t.i.d. 1 m. 1.% O.S. t.i.d.	3 hrs.		O.D. 1.5 mm.; O.S. 1.5 mm. O D. 4.5 mm.; O.S 4.0 mm.
	12/14/33			8:50 a.m	142/85	None			6/4	6/3	24	30	23.5	87.5	0.54/190 mm.	77 da.	1 m. .5% O.D. t.i.d. 1 m. 1.% O.S. t.i.d.	2 hrs.		O.D. 3.5 mm.; O.S. 3.0 mm O.D. 2.5 mm.; O.S. 2.0 mm.
	4/23/34			9:10 a.m.	132/85	None			6/4	6/4	19	29	39.0	158.0	0.54/190 mm.	130 da.	1 m. .5% O.D. t.i.d. 1 m. 1.% O.S. t.i.d.	2½ hrs.		O.D. 2 0 mm.; O.S. 2 5 mm.
Case VIII H.J.	5/29/31	61	M.	11:00 a.m.	110/80	6:45 a.m.	No changes	Dishy nerves; more O.D.	6/21−2	6/18−1	25	45	41.5	37.0	0.51/190 mm.			yes	Arteriosclerosis	1st complaint: achy eyes; halos about lights. More ocular distress in the evening than in the morning
	6/23/31			5:00 p.m.	110/82	6:45 a.m.			6/7−3	6/18−1	51	50	45.0	34.0	0.51/190 mm.					
	6/23/31			5:50p.m.[5]	110/85	6:45 a.m.			6/7	6/7	40	30	24.0	21.0	0.51/190 mm.			yes		Pupils:
	7/18/31			4:30 p.m.	110/80	6:45 a.m.			6/6+3	6/7−3	21	21	38.0	34.0	0.51/190 mm.			yes		O.D. 3.0 mm.; O.S. 3.0 mm.
	1/30/34			10:15 a.m.	120/100	8:00 a.m.			6/120	6/7−2	52	46	125.0	118.0	0.51/190 mm.	25 da.	1 m. .5% O.U. t.i.d.	4 hrs		O.D. 1.5 mm.; O.S. 2.0 mm.
	1/30/34			12:00 m.[3]	118/85	8:00 a.m.			6/24	6/7−1	46	32	125.0	118.0	0.51/190 mm.	2½ yr.	1 m. .5% O.U. t.i.d.	15 hrs.		
Case IX S.S.	2/ 9/28	52	F.	8:30 a.m.	154/100	7:00a.m''	Slight corneal edema; endothelial	Well-established excavation	6/20	6/42+3	21	18	84.0	28.0	1.00/190 mm.			yes	Obesity; mild diabetes; circulatory lag (functional)	O.D. blurry vision at times; worse in the morning
																				Preoperative
	3/ 3/28			8:30 a.m.	150/95	7:00 a.m.			6/42	6/30	49	32	169.0	72.0	1.00/190 mm.	23 da.	1 m. 1.% O.U. t.i.d.	1½ hrs.		Postoperative
	3/16/28			8:30 a.m.	150/100	7:00 a.m.			6/42	6/30	55	32	206.0	21.5	1.00/190 mm.	36 da.	1 m. 1.% O.U. t.i.d.	1½ hrs.		O.S. developed phthisis with nodules on iris (Enucleation a
	4/18/28			8:30 a.m.	152/100	7:00 a.m.			6/30	6/42	28	28	127.5	18.0	1.00/190 mm.	Cont'ly	1 m. 1.% O.U. t.i.d.	1½ hrs.		few months later)
	12/19/29			8:30 a.m.	142/85	7:00 a.m.			6/120+2	6/20+2	23	10	268.0	110.0	1.25/190 mm.			6 mos.		

*Therapeutic Test***

[1] Pilocarpine 1 m. .5% once O.U.
[2] Pilocarpine 1 m. 4% once O.U.
[3] Pilocarpine 1 m. 4% once O.U.
[4] Eserine 1 m. 1% once O.U.
[5] Eserine 1 m. .5% once O.U.
' No patient had more than one cup of coffee.
'' This patient is the only one who had two cups of coffee for breakfast.
* Decreased acuity probably due to small pupil reducing illumination.
** When eserine or pilocarpine was instilled, a restudy was made 30 minutes later.

Table 2

DATA ON TWELVE CASES OF GLAUCOMA SIMPLEX

s.C.M.

Date	Tension	Vision	Scotoma	Object
7/29/27	O.D. 28	6/7	52.	1. /190 mm
	O.S. 28	6/6	56.	
*8/ 5/27	O.D. 28	6/7	50.	1. /190 mm.
	O.S. 28	6/6	51.	
10/ 1/27	O.D. 27	6/7−2	60.	1. /190 mm.
	O.S. 22	6/4−3	57.	
10/ 6/27	O.D. 27	6/7−2	90.	1. /190 mm.
	O.S. 22	6/6−3	77.	
*10/11/27	O.D. 19	6/7	59.	1. /190 mm.
	O.S. 22	6/4	57.	
*11/17/27	O.D. 22	6/7	57.	1. /190 mm.
	O.S. 22	6/4	63.	
1/25/28	O.D. 32	6/7−1	143.	1. /190 mm.
	O.S. 39	6/4−2	130.	
*1/31/28	O.D. 28	6/6−2	54.	1. /190 mm.
	O.S. 28	6/4	64.	
*3/ 1/28	O.D. 32	6/6−2	53.	1. /190 mm.
	O.S. 22	6/4	53.	
3/23/28	O.D. 32	6/6−1	65.	1. /190 mm.
	O.S. 22	6/4	56.	
3/26/28	O.D. 32	6/6−1	89.	1. /190 mm.
	O.S. 32	6/4	65.	
*4/10/28	O.D. 22	6/6	54.	1. /190 mm.
	O.S. 42	6/4−2	57.	
5/ 3/28	O.D. 60	6/6−2	57.	1. /190 mm.
	O.S. 32	6/4	57.	
5/25/28	O.D. 26	6/6−3	55.5	1. /190 mm.
	O.S. 22	6/4	53.	
*10/23/28	O.D. 27	6/6+4	73.5	1. /190 mm.
	O.S. 35	6/4	63.	
11/3/28	O.D. 22	6/6−3	87.	1. /190 mm.
	O.S. 19	6/4	75.5	
*11/10/28	O.D. 23	6/6−3	58.	1. /190 mm.
	O.S. 28	6/4	56.	
12/15/28	O.D. 22	6/6−2	60.	1. /190 mm.
	O.S. 28	6/4−3	56.	
1/19/29	O.D. 36	6/7+2	65.	1. /190 mm.
	O.S. 28	6/4−2	62.	
1/23/29	O.D. 27	6/7−2	65.5	1. /190 mm.
	O.S. 22	6/4−2	65.	
2/16/29	O.D. 22	6/7+2	121.	1. /190 mm.
	O.S. 27	6/4−3	68.	
2/21/29	O.D. 22	6/7+2	88.	1. /190 mm.
	O.S. 42	6/4−3	93.	
3/16/29	O.D. 22	6/6−3	79.	1. /190 mm.
	O.S. 22	6/4	74.	
*3/23/29	O.D. 26	6/7−2	75.	1. /190 mm.
	O.S. 24	6/4−1	62.	
5/25/29	O.D. 23	6/4−4	129.	1. /190 mm.
	O.S. 20	6/4−2	79.	
6/ 8/29	O.D. 22	6/7+2	77.	1. /190 mm.
	O.S. 20	6/4−2	68.	
6/11/29	O.D. 26	6/12+3	57.	1. /190 mm.
	O.S. 26	6/6+1	57.	
*6/14/29	O.D. 23	6/7	79.	1. /190 mm.
	O.S. 21	6/6+4	70.	
6/20/29	O.D. 22	6/7−1	62.	1. /190 mm.
	O.S. 26	6/4	66.	

s.C.M.

Date	Tension	Vision	Scotoma	Object
7/25/29	O.D. 22	6/6	81.	1. /190 mm.
	O.S. 22	6/4	65.	
9/ 5/29	O.D. 22	6/6−2	77.	1. /190 mm.
	O.S. 22	6/4	80.	
11/ 2/29	O.D. 23	6/7−3	99.	1. /190 mm.
	O.S. 21	6/4−2	76.	
*11/ 5/29	O.D. 20	6/6+3	57.	1. /190 mm.
	O.S. 20	6/4−2	61.	
*1/ 3/30	O.D. 22	6/6−3	118.	1. /190 mm.
	O.S. 19	6/4−2	75.	
*1/18/30	O.D. 22	6/12−2	67.5	1. /190 mm.
	O.S. 20	6/4	67.	
*3/ 8/30	O.D. 24	6/7−1	66.	1. /190 mm.
	O.S. 20	6/4−1	81.	
*3/14/30	O.D. 22	6/7/−3	66.	1. /190 mm.
	O.S. 22	6/4−1	76.	
6/ 2/30	O.D. 25	6/7−3	65.	.51/190 mm.
	O.S. 25	6/4−2	66.	
*6/ 5/30	O.D. 20	6/6	29.	.51/190 mm.
	O.S. 21	6/4	26.	
12/ 6/30	O.D. 28	6/6	44.	.51/190 mm.
	O.S. 32	6/4−2	32.	
1/23/31	O.D. 22	6/6/−4	42.	.49/190 mm.
	O.S. 24	6/6−3	29.	
3/28/31	O.D. 30	6/12	76.	.49/190 mm.
	O.S. 30	6/6−2	95.	
**3/28/31	O.D. 21	6/6−2	46.	.49/190 mm.
	O.S. 19	6/4	49.	
*4/11/31	O.D. 21	6/7	32.5	.51/190 mm.
	O.S. 19	6/4−2	29.	
*5/ 2/31	O.D. 26	6/7−1	48.	.51/190 mm.
	O.S. 31	6/6+1	42.	
9/ 4/31	O.D. 46	6/6	59.	.51/190 mm.
	O.S. 34	6/4	42.	
12/19/31	O.D. 42	6/6	51.	.51/190 mm.
	O.S. 30	6/4	75.	
4/ 9/32	O.D. 28	6/12−2	69.	.51/190 mm.
	O.S. 22	6/4	83.	
*4/16/32	O.D. 30	6/6−2	34.	.51/190 mm.
	O.S. 28	6/4	40.	
/17/32	O.D. 21	6/4−2	51.	.51/190 mm.
	O.S. 22	6/4	42.5	
1/26/33	O.D. 34	6/6−3	164.	.51/190 mm.
	O.S. 23	6/4	98.	
*2/ 2/33	O.D. 34	6/6+1	105.	.51/190 mm.
	O.S. 24	6/4	62.	
*2/13/33	O.D. 25	6/7−2	40.	.47/190 mm.
	O.S. 22	6/6+3	51.	
*4/29/33	O.D. 21	6/6	76.	.47/190 mm.
	O.S. 28	6/4	31.	
1/29/34	O.D. 30	6/4−3	73.	.54/190 mm.
	O.S. 45	6/4	90.	

s.L.M.

Date	Tension	Vision	Scotoma	Object
3/25/33	O.D. 27	6/4	73.5	.47/190 mm.
	O.S. 28	6/4−2	92.5	
*3/27/33	O.D. 28	6/4−3	32.	.47/190 mm.
	O.S. 24	6/4	37.	
4/18/33	O.D. 31	6/4	58.	.47/190 mm.
	O.S. 28	6/4−4	48.	

H.G.

Date	Tension	Vision	Scotoma	Object
*8/ 1/32	O.D. 28	6/6−1	46.5	.52/190 mm.
	O.S. 22	6/6	53.5	
9/27/32	O.D. 27	6/6	29.5	.51/190 mm.
	O.S. 20	6/6	32.5	
12/15/32	O.D. 32	6/4−4	36.5	.51/190 mm.
	O.S. 28	6/4−3	41.	
*1/31/33	O.D. 24	6/4−3	60.	.51/190 mm.
	O.S. 24	6/4−2	34.	
*6/ 2/33	O.D. 26	6/4	25.5	.54/190 mm.
	O.S. 21	6/4	34.	

M.S.

Date	Tension	Vision	Scotoma	Object
2/ 8/28	O.D. 22	6/7	20.	.50/190 mm.
	O.S. 22	6/7	23.	
1/15/29	O.D. 22	6/7	20.	.50/190 mm.
	O.S. 24	6/7	23.	
10/24/33	O.D. 39	6/12	46.	.50/190 mm.
	O.S. 35	6/7−2	38.5	
10/31/33	O.D. 34	6/12	67.5	.50/190 mm.
	O. S. 30	6/7	50.	
*10/31/33	O.D. 32	6/6−1	29.	.50/190 mm.
	O.S. 24	6/6+4	31.	

A.G.

Date	Tension	Vision	Scotoma	Object
8/12/29	O.D. 12	Blind	....	1. /190 mm.
	O.S. 24	6/4	78.	
*8/16/29	O.D. ..	....	....	
	O.S 26	6/4	76.	1. /190 mm.
(O.D. enucleated 4/11/31)				
5/19/32	O.S. 38	6/4−3	69.	.51/190 mm.
*6/ 7/32	O.S. 36	6/4	50.	.51/190 mm.
11/25/33	O.S. 50	6/6−2	122.	.50/190 mm.
*11/27/33	O.S. 36	6/4−2	94.	.50/190 mm.
*12/11/33	O.S. 35	6/15	79.	.50/190 mm.
*1/22/34	O.S. 34	6/15−3	78.	.50/190 mm.
*1/30/34	O.S. 23	6/15−2	49.	.50/190 mm.
*2/ 6/34	O.S. 28	6/60	59.	.50/190 mm.
2/16/34	O.S. 39	6/4	59.5	.50/190 mm.

Note: 6 earlier scotoma studies not included—not pathologic.

A.B.

Date	Tension	Vision	Scotoma	Object
3/27/33	O.D. 45	6/6+3	90.	.86/190 mm.
	O.S. 50	6/4	134.	
*3/31/33	O.D. 32	6/6	68.	.86/190 mm.
	O.S. 35	6/6−2	67.5	
*4/11/33	O.D. 31	6/4−1	44.	.86/190 mm.
	O.S. 28	6/4−1	97.	
*10/ 5/33	O.D. 31	6/6	66.5	.86/190 mm
	O.S. 36	6/6−1	123.5	
*11/ 2/33	O.D. 39	6/4−1	121.5	.86/190 mm.
	O.S. 41	6/4	125.	
4% Pilo.				
11/ 2/33	O.D. 28	6/60	79.	.86/190 mm.
	O.S. 32	6/60+1	112.	

Note: 8 days previous to 11/2/33, patient received—through an error—3 c.c. instead of .3 c.c. of histamine.

D.B.

Date	Tension	Vision	Scotoma	Object
9/ 8/33	O.D. 28	6/4−2	63.	.54/190 mm.
	O.S. 51	6/6−2	164.5	
**9/ 8/33	O.D. 22	6/6−3	34.5	.54/190 mm.
	O.S. 32	6/4−1	115.	
*9/21/33	O.D. 25	6/4−3	56.5	.54/190 mm.
	O.S. 43	6/4	111.	
*9/28/33	O.D. 22	6/4	48.5	.54/190 mm.
	O.S. 28	6/4	135.5	
*12/14/33	O.D. 24	6/4	23.5	.54/190 mm.
	O.S. 30	6/3	87.5	
4/23/34	O.D. 19	6/4	39.	.54/190 mm.
	O.S. 29	6/4	158.	

H.J.

Date	Tension	Vision	Scotoma	Object
5/29/31	O.D. 25	6/21−2	41.5	.51/190 mm.
	O.S. 45	6/18−1	37.	
6/23/31	O.D. 51	6/7−3	45.	.51/190 mm.
	O.S. 50	6/18−1	34.	
**6/23/31	O.D. 40	6/7	24.	.51/190 mm.
	O.S. 30	6/7	21.	
*7/18/31	O.D. 21	6/6+3	38.	.51/190 mm.
	O.S. 21	6/7−3	34.	
*1/30/34	O.D. 52	6/120	125.	.50/190 mm.
	O.S. 46	6/7−2	118.	
***1/30/34	O.D. 46	6/24−1	125.	.50/190 mm.
	O.S. 32	6/7−1	118.	

H.S.

Date	Tension	Vision	Scotoma	Object
6/14/28	O.D. 59	6/30	79.	1. /190 mm.
	O.S. 50	6/15	49.	
*6/19/28	O.D. 21	6/18+2	28.5	1. /190 mm.
	O.S. 42	6/12+1	27.	
*7/24/28	O.D. 42	6/18	29.	1. /190 mm.
	O.S. 37	6/7	33.	
*9/17/28	O.D. 42	6/18−2	33.	1. /190 mm.
	O.S. 40	6/7−2	53.	
*9/25/28	O.D. 42	6/18−1	43.	1. /190 mm.
	O.S. 43	6/7−2	70.	
*10/ 7/28	O.D. 47	6/18	57.	1. /190 mm.
	O.S. 43	6/7	37.	
*10/23/28	O.D. 47	6/18+3	70.	1. /190 mm.
	O.S. 42	6/7+4	31.	

P-O.

Date	Tension	Vision	Scotoma	Object
11/21/28	O.D. 22	6/18	47.	1. /190 mm.
	O.S. 22	6/12+3	29.	
12/18/28	O.D. 25	6/30	43.	1. /190 mm.
	O.S. 22	6/18	27.	
3/ 5/29	O.D. 20	6/42+1	41.	.97/190 mm.
	O.S. 23	6/15+3	38.	
3/15/29	O.D. 22	6/42	36.	1. /190 mm.
	O.S. 22	6/12	34.	
6/11/29	O.D. 21	6/40+2	54.	1. /190 mm.
	O.S. 31	6/12−1	24.	
*7/30/29	O.D. 23	6/24	44.	1. /190 mm.
	O.S 30	6/7	30.	
*10/ 1/29	O.D. 22	6/24	73.	1. /190 mm.
	O.S. 32	6/12+4	39.	
10/10/29	O.D. 12	6/42+2	115.	1. /190 mm.
	O.S. 21	6/12	32.	

H.S.

Date	Tension	Vision	Scotoma	Object
12/11/30	O.D. 23	6/21+2	47.	.9 8/190 1 1
	O.S. 40	6/7	25.	
5/24/32	O.D. 38	6/30	47.	1.05/190 mm.
	O.S. 32	6/24	38.	

Note: P-O. designates postoperative O.U.

S.S.

Date	Tension	Vision	Scotoma	Object
*2/ 9/28	O.D. 21	6/20	84.	1. /190 mm.
	O.S. 18	6/42+3	28.	
*3/ 3/28	O.D. 49	6/30	169.	1. /190 mm.
	O.S. 32	6/42	72.	
*3/ 7/28	O.D. 70	6/42	83.5	1. /190 mm.
	O.S. 28	6/42+3	17.	
*3/16/28	O.D. 55	6/42	206.	1. /190 mm.
	O.S. 32	6/30	21.5	
P-O.				
*4/18/28	O.D. 28	6/30	127.5	1. /190 mm.
	O.S. 28	6/42	18.	
*8/ 1/28	O.D. 20	6/30	204.	1. /190 mm.
	O.S. 30	6/24	19.	
*11/14/28	O.D. 22	6/30	253.	1.15/190 mm.
	O.S. 35	6/120	32.	
12/19/29	O.D. 23	6/120+2	268.	1.25/190 mm.
	O.S. 10	6/20+1	110.	
10/25/30	O.D. (enucleated)			
	O.S. 20	6/20+3	47.5	.90/190 mm.
4/17/31	O.S. 20	6/24	36.	.90/190 mm.
6/18/31	O.S. 19	6/24	74.	.85/190 mm.
*4/ 7/33	O.S. 19	6/14+2	106.	.86/190 mm.
4/15/33	O.S. 18	6/14−4	104.	.86/190 mm.

Note: P-O. designates postoperative

A.M.

Date	Tension	Vision	Scotoma	Object
4/12/27	O.D. 24	6/42+1	26.	1.5 /190 mm.
	O.S. 28	6/14	20.5	
1/ 4/30	O.D. 26	6/42+1	52.5	1.5 /190 mm.
	O.S. 30	6/30+2	72.5	

A.M.

Date	Tension	Vision	Scotoma	Object
*1/ 7/30	O.D. 32	6/24	32.5	1.5 /190 mm.
	O.S. 30	6/15	30.5	
*1/30/30	O.D. 28	6/15	31.	1.5 /190 mm.
	O.S. 25	6/15	27.5	
*4/ 5/30	O.D. 28	6/15	62.5	1.5 /190 mm.
	O.S. 22	6/10−3	45.	

A.A.F.

Date	Tension	Vision	Scotoma	Object
5/11/28	O.D. 33	6/120	15.	.51/190 mm.
	O.S. 35	6/30	19.	
6/24/28	O.D. 31	6/120	17.	.51/190 mm.
	O.S. 41	6/30	33.	
1/ 2/30	O.D. 28	6/120	50.	.51/190 mm.
	O.S. 50	6/24	50.	
2/20/30	O.D. 21	6/120	50.	.51/190 mm.
	O.S. 40	6/30	96.5	
**2/20/30	O.D. 21	6/42	19.	.51/190 mm.
	O.S. 40	6/30	45.	
**2/20/30	O.D. 21	6/42	19.	.51/190 mm.
	O.S. 30	6/20+3	20.	
*3/17/30	O.D. 21	6/42+1	30.	.51/190 mm.
	O.S. 25	6/14−2	40.	
*4/14/30	O.D. 42	6/60+1	26.	.51/190 mm.
	O.S. 37	6/20−3	38.5	
5/ 5/30	O.D. 40	6/120	54.5	.51/190 mm.
	O.S. 46	6/24−3	60.	
*5/ 8/30	O.D. 19	6/24−2	42.	.51/190 mm.
	O.S. 18	6/14−3	54.	
6/ 2/30	O.D. 28	6/30+3	37.	.51/190 mm.
	O.S. 28	6/10	37.5	
10/ 4/30	O.D. 28	6/60	57.	.67/190 mm.
	O.S. 23	6/24−2	60.5	
*10/10/30	O.D. 24	6/60+2	94.5	.97/190 mm.
	O.S. 26	6/24+1	99.5	
3/31/32	O.D. 24	6/60	61.	.70/190 mm.
	O.S. 24	6/40+2	102.	

(Operated on for acute glaucoma O.U.—2/28/31)

All cases, vision uncorrected
* Under myotic treatment.
** Eserine test.
*** After 4% Pilo.

graphs), occasions on which the clinical evidence made it seem necessary to use a myotic. There were, however, intervals in which the variability of the curves was very evident at times when no medication was employed. Of course, the ideal way to study a whole group of these early glaucoma cases would be to make maps every hour for weeks; to have some optical means of measuring intraocular pressure continually, and of gauging the most minute variations of visual acuity, perhaps even sufficiently fine to show the influence of pulse and respiration. Such, unfortunately, is not possible at our present stage of development. Nevertheless, the writer thought it would be valuable to study a single case as thoroughly as practicable, and so a patient with simple glaucoma who had been studied over a long period of time and who had had one "major crisis," was selected from this group (see case A. G. appearing in the graph and in tables 1 and 2). The earliest practical time for this patient to present himself at the office was shortly before eight o'clock in the morning, so that the first study could be made at eight o'clock and each succeeding hour all day. The patient does not smoke and has been in the habit of taking two teaspoonfuls of coffee in hot water and milk for breakfast. This was not modified on the days of examination. Earlier studies had failed to show that this amount of coffee influenced the area of his scotoma,

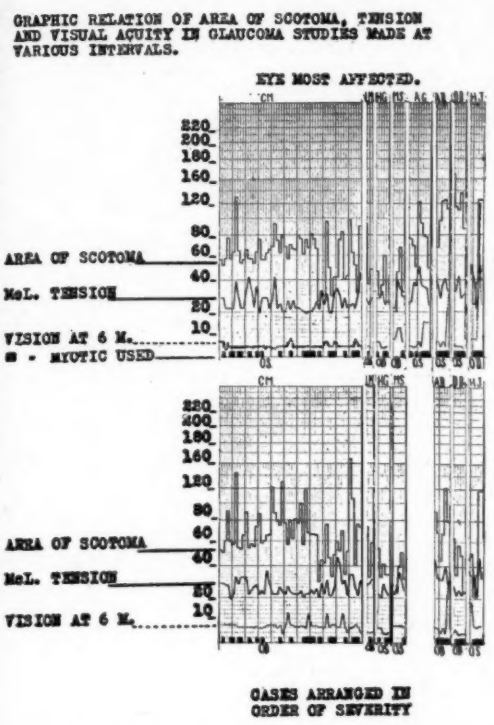
GRAPHIC RELATION OF AREA OF SCOTOMA, TENSION AND VISUAL ACUITY IN GLAUCOMA STUDIES MADE AT VARIOUS INTERVALS.
EYE MOST AFFECTED.
AREA OF SCOTOMA
MoL. TENSION
VISION AT 6 M.
M - MYOTIC USED
CASES ARRANGED IN ORDER OF SEVERITY

Fig. 2 (Evans). Graphic relation of area of scotoma, tension, and visual acuity in glaucoma studies made at various intervals.

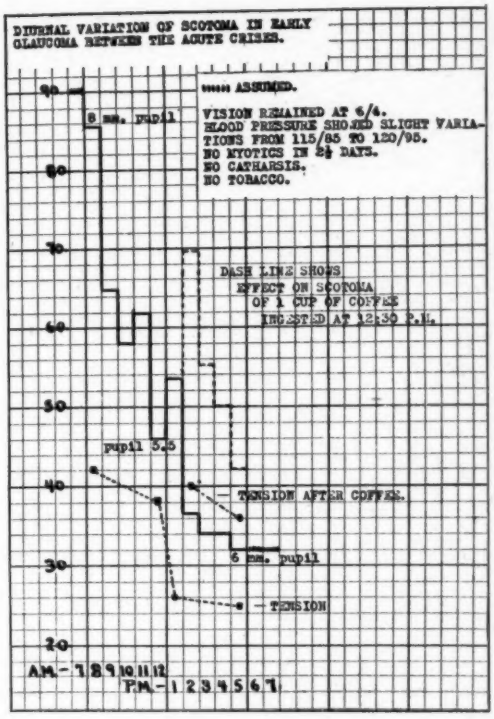
DIURNAL VARIATION OF SCOTOMA IN EARLY GLAUCOMA BETWEEN THE ACUTE CRISES.
ASSUMED.
VISION REMAINED AT 6/4.
BLOOD PRESSURE SHOWED SLIGHT VARIATIONS FROM 115/85 TO 120/95.
NO MYOTICS IN 2½ DAYS.
NO CATHARSIS.
NO TOBACCO.
8 mm. pupil
DASH LINE SHOWS EFFECT ON SCOTOMA OF 1 CUP OF COFFEE INGESTED AT 12:30 P.M.
pupil 5.5
TENSION AFTER COFFEE.
6 mm. pupil
TENSION
A.M. - 7 8 9 10 11 12
P.M. - 1 2 3 4 5 6 7

Fig. 3 (Evans). Diurnal variation of scotoma in early glaucoma between the acute crises.

When scotomata were to be mapped, every effort was made to employ an object of such a size that it could be used as a "standard" throughout the course of the disease (in a particular case). This could not be strictly adhered to, however, for under certain conditions of retinal sensitivity it became necessary to increase or decrease the size of the object. Such a variation must obviously make profound changes in the area of the mapped defect, so that it was necessary to estimate the area which the defect would show had it been mapped with the "standard" object. In order to find a basis for such an estimation, a small series of comparative plottings was made (from the patients used as material for this paper) by using graduated sizes of objects and measuring the area of the resulting maps. The result can be stated thus: an increase of .1 mm. in the size of an object adds 16 s.u. to the area of a 21-s.u. scotoma. From these data a ratio was arranged between the object used and the area of the scotoma as mapped, and the standard object and theoretic area it would have delineated. No doubt this relation would not hold in a strict mathematical sense but the error should not be greater than occurs in any of our numerically stated clinical data. One may not apply this formula to bring all cases to a common standard, as there are many factors peculiar to each individual for which controls cannot be set and for which adjustments cannot be made. From actual measurement it has been found that the normal blind-spot and angio-scotoma concerned in this study represent 21 scotoma units; that in total blindness the area studied represents 258 scotoma units. From a number of years of clinical experience with the McLean tonometer, the author has concluded that the standards proposed by McLean are too high, and for that reason 30 mm. of mercury (as shown by the tonometer scale) has been adopted as the normal upper-limit standard for this study. Visual acuity in all instances has been plotted on this graph as taken from a distance of 6 meters—the normal standard set for this study being 6/4. It has therefore been necessary to plot only the denominator of the fraction.

In a very few instances in which the visual acuity was reduced to worse than the equivalent of 6/21, so that a shorter distance between eye and chart was advisable, the numerator and denominator of the fraction were increased in value to the necessary amount to get the theoretical six-meter equivalent.

tension, or vision to a measurable degree. Care was taken to see that no cathartic was used either on that day or during the preceding week. The subject, as already implied, had been studied on numerous occasions and was thoroughly familiar with the technic. He understood that the procedure was simply for a scientific study, so there is no reason to think that he was unduly excited about the examination. The routine was the same as that employed in the other studies and the technic, identical. Figure 3 illustrates the variation of the scotoma. Tension readings were not taken every hour because it was felt that such frequent application of the tonometer might produce undue irritation and perhaps an artificial tension curve. The visual acuity remained 6/4 throughout the period of study. The graph indicated by the dash lines shows the effect of a single cup of coffee. A week later the study was recommenced, and when a point in the graph had been reached corresponding to that of the week previous, the plottings were resumed.

While it would obviously not be justifiable to say that this group follows the diurnal pressure curve because a single 12-hour study can have departed from that which a typical average would represent, nevertheless it is interesting that the pressure and scotoma curves in this case run relatively parallel and do not depart radically from the classical diurnal pressure curve for the same period. We do not need this study as evidence that coffee is contraindicated in patients, the subjects of glaucoma; but perhaps the graphic way in which its effect is presented in this instance will help us to be more rigid in our instructions to patients. The morning cup of coffee, coming as it does, so near the peak of the diurnal pressure curve, certainly should make us more strict—at least until such time as adequate studies have shown the actual influence of the "morning coffee."

In summary, then, we may say that this small series, using the technic and controls suggested, tends to emphasize the idea that glaucoma simplex should be looked upon as a symptom complex, characterized by numerous minor crises* which may or may not eventuate in a final, fully developed major crisis; that the pressure curve is accompanied quite consistently by a curve of graphed scotoma areas and that fluctuations of central vision probably correspond to these waves. Moreover, when using the technic herein presented, and when the scotoma area is graphed, more minute variations of the condition are evident than by any other single means. With this conception of the process, it would seem fair to conclude that glaucoma studies should be made at the earliest practical time in the morning; that coffee—probably also tea and cocoa—should be eliminated from the diet, and that an effort to correlate scotoma area, intraocular pressure, and visual acuity should become a part of each study in the hope that with the accumulation of more material a better understanding of the mechanism, and hence of the management of glaucoma will result.**

Parenthetically it seems worth while to point out that since vitamin C is known to maintain the integrity of vascular endothelium, and since glaucoma has a direct relation to decreased endothelial integrity, it would be justifiable to order large quantities of vitamin C (a quart of mixed orange and lemon juice a day) as a theoretical precautionary measure in all cases of primary glaucoma. The writer has been following this plan for some time.

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* The classical term "prodromal attack" doubtless represents the apex of these minor crises as depicted in this study.

** The writer wishes to emphasize that transient variations of the scotoma of glaucoma have been included in the studies of other workers, notably Wegener[19] and Samojloff[20]. Their reports should be referred to in connection with this study, and it is essential that recourse be had to the historical sketch of the development of scotometry recently presented by Ralph I. Lloyd[21].

Furthermore the writer wishes to point out that this study, having to do for the most part with the early stages of glaucoma, deals with an entirely different type of evidence from that which appears when nerve atrophy is a pure or superadded feature.

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BILATERAL ABSORPTION OF INTRAOCULAR COPPER WITH CHALCOSIS IN ONE EYE

Report of a Case

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DAVID O. HARRINGTON, M.D.
SAN FRANCISCO

The child whose case is reported here was found to have particles of copper in both eyes after the explosion of percussion caps. Due perhaps to the low content of copper in the metal of the caps, spontaneous absorption of the foreign bodies in both eyes was not accompanied by the destructive changes usually observed in such cases. One eye demonstrated the phenomenon of chalcosis; this eye (left) retained normal vision for eight years after the accident. From the Department of Surgery, Division of Ophthalmology, University of California Medical School. Read before the Western Ophthalmological Society at Butte, Montana, July 19, 1934.

The rarity of the phenomenon warrants the report of a case of spontaneous absorption of intraocular copper fragments in the vitreous of both globes, together with the presence of chalcosis in one eye. Especially interesting is the retention of almost normal vision in one eye eight years after the accident.

Case Report

Virginia S., aged 6 years, was seen first on March 23, 1926, with the following history:

On March 22, 1926, while playing with percussion caps, several of them exploded, injuring her and several companions. The patient was treated for injuries to the face in the Emergency Hospital but no injuries to the eyes were noted. The following day, the right eye became injected and the patient reported to Stanford University Eye Clinic and was seen later in the day in our office. The child was nervous and very unruly so that examination was difficult.

Examination: Vision was: right eye, 20/40 and left eye, 20/20. The right eye showed rather marked ciliary injection with a penetrating wound of the cornea. The pupil was irregular with iridodialysis above and temporally. The lens showed a penetrating injury with beginning traumatic cataract. The lower half of the fundus was seen with difficulty and was grossly normal.

The results of the external examination of the left eye and fundus were grossly normal but because of the child's behavior, a detailed examination was impossible.

X-ray examination of the right eye taken at this time showed a foreign body 0.5 by 1.0 mm. in diameter, of metallic density in the sclera. Exact localization was difficult because of poor cooperation.

The patient was sent to the San Francisco Hospital and given an injection of milk and local treatment to the right eye. After a few days' hospitalization, the child's cooperation was much better so that, on April 6, 1926, a more detailed examination was possible. At this time, the right eye showed considerably less ciliary injection and an opaque lens that prevented examination of the fundus. The fundus of the left eye was carefully examined at this time and a foreign body was discovered in its vitreous. This appeared as a shining, thin, metallic, curved body, lying 3 diopters in front of the retina and about 3 disc diameters above and slightly nasally to the disc. It measured about one-half disc diameter in its greatest width. It moved slightly with movement of the eye and was situated more anteriorly when the patient sat up. The wound of entry was apparently temporal to the limbus, a small scar being visible there.

X-rays taken April 15, 1926, showed the foreign body in the right eye to have moved far from its former position so that it lay in the temporal side of the eyeball slightly below and slightly posterior to the middle. Fixation for localization of a foreign body in the left eye could not be maintained but stereo-

scopic studies of the left eye showed a foreign body apparently in the upper lid and a number of very fine foreign bodies which might be in the eyeball. They were of metallic density.

The condition of the right eye continued to improve and the left eye showed no reaction. X-ray examinations on April 22, 1926 for localization, showed the foreign bodies in both eyes to be free in the vitreous.

This patient was presented at the meeting of the Pacific Coast Oto-Ophthalmological Society in San Francisco and the general consensus of opinion was that, with a foreign body in the vitreous of both eyes, it seemed best to leave them alone and let the child have vision as long as possible.

A course of "watchful waiting" was decided upon with consideration of extraction of the traumatic cataract in the right eye when all signs of inflammation had subsided.

The patient was discharged from the hospital and disappeared for two months, after which time examination in the University of California Eye Clinic showed a quiet right eye with posterior synechia and a cataractous lens. No details of the fundus were seen. The left eye showed no external pathologic changes but the foreign body could be seen floating in the vitreous which contained many small strand-like opacities.

The patient again disappeared until March 30, 1928, when she reported because of a mild acute conjunctivitis. Vision in the right eye was light perception. Most of the traumatic cataract had been absorbed. The fundus was not visible. Vision in the left eye was 20/30. There was no injection. The anterior surface of the lens showed a brownish, metallic, very slightly lustrous, disciform opacity which, with oblique illumination, appeared very dense. On ophthalmoscopic examination, however, no difficulty was encountered in seeing through it. Examination with the slitlamp showed this opacity to be directly beneath the anterior capsule of the lens and to have a decided metallic luster. The vitreous showed a few small opacities but careful search of the fundus failed to reveal the presence of a foreign body. Because of this, X-ray films were made again. These showed an intraocular foreign body in the right eye but none in the left. Repeated X-ray examinations gave the same results.

Four-and-one-half years later, the patient was located and sent for. Examination showed vision in the left eye to be 20/30, with correction (—0.50 D.sph. ⊂⊃ +2.00 D.cyl. axis 90°). The right eye diverged slightly. There was no injection. The corneal scar was present, above and nasally. There was a marked iridodonesis and a secondary cataract with a minute hole in the center. No details of the fundus were seen. The field was grossly normal.

Left eye: The cornea and iris were normal. The anterior surface of the lens showed, as before, a brownish, disciform opacity, about 3 mm. in diameter, with serrated edges, the center being thinner than the border. There were also seen some fine capsular and subcapsular opacities, posteriorly. The fundus was normal. There were a few fine opacities in the vitreous. Several sets of X-ray examinations at this time failed to show evidence of foreign bodies in either eye.

On March 6, 1934, the patient was seen again and the examination gave essentially the same results as those above. The brown anterior capsular ring was the only evidence of chalcosis. The opacity, however, seemed definitely less dense, particularly in the center. Examination of the fundus failed to reveal any sign of an intraocular foreign body or any trace of a previously existing one.

The intraocular foreign bodies most often met with are bits of iron, steel, copper, stone, glass, porcelain, splinters of wood, shot, grains of powder, and particles of sand. Of these, the prognosis appears to be poorest in the case of copper. Roemer[1] stated that "if a piece of percussion cap is in the anterior chamber, a purulent iridocyclitis develops; if it has penetrated into the vitreous, it shortly becomes enveloped by a large collection of pus, which necessitates the enucleation of the eye. In the lens alone, minute particles of cop-

per may be borne for years and produce no bad effects, aside from the formation of a cataract."

The majority of authors are fairly well agreed that of all the metals, copper seems to excite the most violent chemical reaction, so that, even in the absence of infection, the degenerative changes are very marked.

The tolerance of the ocular structures to the various types of foreign bodies was shown by Leber[2] in his classical work. He found that copper is among the most irritating of foreign bodies and that its action is a chemical one resulting from oxidation.

Of foreign bodies in the vitreous, Fuchs[3] stated that these usually excite violent inflammation because of which the eye is destroyed.

Writing of copper in the vitreous, Würdemann[4] stated that, even if aseptic, they nearly always caused severe inflammation from chemical irritation, producing an aseptic purulent exudate. Later, this caused thickening and shrinking of the vitreous with total detachment of the retina, and iridocyclitis. Finally, after months of painful inflammation, atrophy of the globe developed. It was stated that when copper particles remained in the eye, it was usually lost and had to be removed.

Cases have been recorded in which copper particles have remained in an eye for a long period of time. Often these become encapsulated and may cause no trouble for many years. A typical case of this type was reported by one of us[5] in which a copper fragment of a percussion cap had been retained in the globe over a period of forty-six years. Because of an acute inflammation of the affected eye with sympathetic irritation in the other, enucleation became necessary.

There have been frequent instances in which, while the sight was lost as the result of plastic inflammation, the eye has remained otherwise unaffected. It is impossible, however, to estimate how long such eyes may remain quiet without the condition becoming active and producing sympathetic ophthalmia in the other eye.

In addition to the foregoing, there have been reports of small particles of copper becoming encapsulated in the vitreous with retention of normal vision. Decker[6] reported such a case with normal visual acuity and clear media.

Spontaneous expulsion of intraocular foreign bodies has been reported a number of times since Castelnau[7] first recorded this phenomenon in 1842. It apparently occurs far more frequently with copper than in the case of iron or other foreign bodies. This has been explained as being the result of the action of the copper salts on the uveal and scleral tissues, softening them so that the foreign body extrudes at this point[8]. Blake[9] reported two cases of this type in which a small copper fragment was spontaneously expelled some time after its entry. In reviewing the literature, he stated that the foreign body was often extruded at its point of entry and that its migration was always forward.

Spontaneous absorption of intraocular foreign bodies of iron is well recognized. The picture of siderosis is so familiar that description is unnecessary. Many such cases, in which there were disastrous results to the eye, are to be found in the literature. We recently saw a patient who came because of active inflammation in a previously quiet blind eye. The vision had been defective for 20 years and was first noticed some time after what the patient termed a minor accident. He had been told that the defective vision resulted from a congenital defect. Examination showed a typical siderosis, which was confirmed pathologically. X-ray examinations for foreign bodies were negative. In other words, at the time of the so-called minor injury, a foreign body had entered the eye and, in absorbing, had produced siderosis with destruction of the vision. It is rather interesting that the eye remained quiet for 20 years before developing an iridocyclitis.

Very little has been written about the spontaneous absorption of intraocular particles of copper; Leber[2] pointed out that a few very minute copper foreign bodies may go on to complete absorption with general diffusion of the copper salt. This process produces what is termed chalcosis.

Chalcosis, or so-called copper cataract, was recognized during the World War as being caused by retained particles of copper. Ertl[10], in 1903, described the picture of chalcosis in a case of intraocular copper but Purtscher[11], in 1918, was the first to point out that it was diagnostic of retained particles of copper. Since then, it has been reported a number of times. According to Jess[12], there is a definite reason for its discovery as an entity at a comparatively recent date. During the World War, because of the scarcity of copper, the various explosive shells were made of metal containing a relatively small percentage of copper. Consequently, if a particle of this metal entered the eye, the violent reaction produced by pure copper was not present; instead there was a slow oxidation of the copper with the production of chalcosis.

The characteristic picture of chalcosis, as a rule, begins to appear several years after the introduction of the foreign body. There is present on the lens a disciform opacity occupying the pupillary area. It is greenish gray in color and rather metallic in appearance. In marked cases, the color may be a definite green. The edges of the ring are often serrated, with lines radiating to the periphery of the lens. With oblique illumination, the opacity appears rather dense, but little difficulty is experienced, as a rule, in seeing through it with the ophthalmoscope.

Under the higher power of the slit-lamp, this disciform cataract is seen to be composed of multiple minute particles that appear to be just below the capsule of the lens. There is also some discoloration of the iris.

Microscopic examination shows this opacity, which has been identified as copper carbonate, to be situated between the anterior capsule of the lens and the epithelial cells. In the more marked cases, this copper carbonate is found in the deeper layers of the lens.

The ultimate fate of eyes with chalcosis has not been determined. It is necessary that more time elapse before any definite conclusions can be made. Jess[13] felt that in as much as the copper carbonate was not permanently combined with the albumin of the cells, there was a definite possibility that, following the complete absorption of the copper fragment, the opacity might disappear gradually. Zur Nedden[14] in 1903, reported the disappearance of an opacity of the lens (probably chalcosis) ten years after the removal of an intraocular foreign body of copper. In our patient, the opacity appeared to be definitely thinner at the last examination.

Comments

In the foregoing case report, the question immediately arises as to whether the foreign bodies were extruded or absorbed. Any reaction that would soften the sclera sufficiently to permit extrusion of a foreign body would have caused noticeable inflammation. Having been duly warned, the guardians would have sought medical aid at once if the eyes had become inflamed. This is borne out by the fact that when the child developed a mild conjunctivitis, she was brought to the clinic immediately.

The fact that the foreign bodies were small would make absorption feasible. In addition, the presence of well-defined chalcosis speaks rather strongly against extrusion. We feel that there can be little doubt of this being a case of absorption and not extrusion.

One outstanding factor is the lack of degeneration or destructive changes usually seen with retained intraocular particles of copper. This can be explained on the basis of the possibility of the metal of the percussion caps' containing a relatively small percentage of copper.

The retention of almost normal vision in one eye is also noteworthy.

This patient demonstrates the necessity of careful examination of both eyes even though only one appears to be injured. When the child was first examined, the vision of the left eye was normal and there was nothing present to suggest possible injury to that eye. Gross examination of the fundus, attempted in an unruly and frightened child, appeared to be negative. After the child's confidence had been gained and careful ophthalmoscopy was possible,

the foreign body was discovered in the vitreous. X-ray examination of both orbita at the initial visit would have revealed the presence of a foreign body in the apparently uninjured eye.

At the last examination, the opacity of the lens appeared to be definitely thinner than at previous visits. It will be interesting to follow this patient and to determine whether or not the opacity will disappear entirely.

Summary

1. The case reported here is that of a child who, following the explosion of a number of percussion caps, had particles of copper in both eyes.

2. There was spontaneous absorption of the foreign bodies of both eyes, without the destructive changes usually seen with copper. It is possible that this may be the result of a low percentage of copper being present in the metal of the percussion caps.

3. One eye demonstrated the phenomenon of chalcosis, a rather rare occurrence.

4. The left eye has retained normal vision eight years after the accident.

5. The necessity of careful examination of both eyes, even though only one appears to be injured, is evident.

384 Post Street.

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PHOTOGRAPHY OF THE EYE WITH THE MINIATURE CAMERA

RAMON CASTROVIEJO, M.D.
NEW YORK CITY

Various methods are described for utilizing the miniature camera for close-up photographs of the eye, as employed in the Columbia Presbyterian Medical Center. The lens is stopped down to f:9 or f:12.5, the small aperture obtaining depth of focus and a good definition of all parts of the eye. Proper illumination for normal and photosensitive eyes is given in detail. The excellent illustrations confirm all that is claimed for the technic. From the Institute of Ophthalmology, Columbia Presbyterian Medical Center.

Recent advances in photography have made it possible for the amateur to take accurate close-up photographs of the eye, previously only possible for professionals. In a recent article by Pierce in the American Journal of Ophthalmology (1934, v. 17, p. 527), the use of the miniature camera for photography of the eye was recommended. The method described by Pierce is simple, and should yield excellent results. The miniature cameras of today are instruments of precision, equipped with very high-speed lenses and winding mechanisms that permit rapid shifting of film between exposures. The small size of the film used contributes materially to economy of operation and time. Hence, the modern miniature camera is ideally suited for clinical photography. Ophthalmologists will find it especially useful for carefully recording case histories, as pointed out by Pierce.

At the Institute of Ophthalmology, Columbia Presbyterian Medical Center, the miniature camera has been used for the past few years for close-up photographs of the eye, with very consistent results. The technic used was, however, somewhat different from that described by Pierce. It is the purpose of this paper to present briefly some other ways in which the miniature camera can be used for the photography of the anterior segment of the eye and its adnexa. These may be of value to ophthalmologists using the miniature camera, since the method best suited for each particular case can be selected.

The photographic outfit is mounted upon the heavy compound base of a corneal microscope or other similar instrument. The base is equipped with cross-slide, adjustable movement, which is particularly well adapted as a support for the camera; while extremely rigid, it permits free and fully controlled movement of the camera in every desired direction for adjustment and focusing, without being subject to vibrations. Figure 1 gives a detailed arrangement of the outfit. This is assembled from the following units and parts (figure 2): miniature camera with a 50-mm.-focal-length lens, sliding focusing attachment with magnifier, 30-mm. ex-

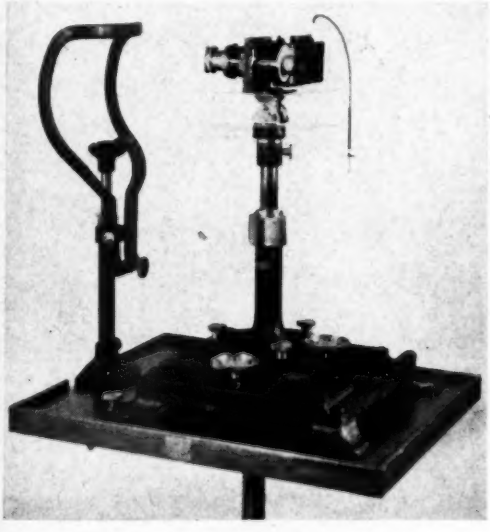


Fig. 1.

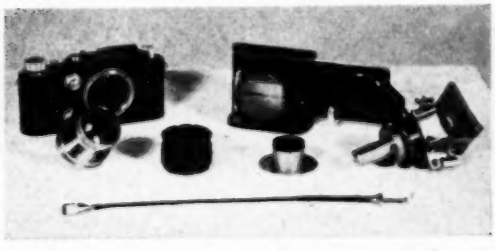


Fig. 2.

Fig. 1 (Castroviejo). Equipment assembled for photography of the eye with the miniature camera.

Fig. 2 (Castroviejo). The dissembled parts of the equipment.

tension tube, cable release, and a special adapter to mount the camera on the base.

The outfit having been assembled, correct exposures are calculated with

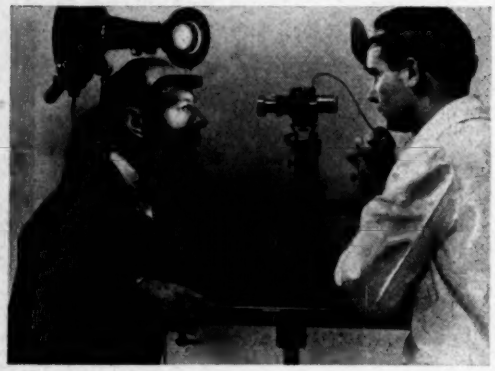


Fig. 3 (Castroviejo). Arrangement for illumination with spotlight and head mirror.

the aid of the Western photo-electric exposure meter. Factors of film, filters, and extension tube being known, it is a simple matter to arrive at the correct timing of the shutter. The lens is usually stopped down to f:9 or f:12.5. Such a small aperture is required to obtain great depth of focus, usually not available at such close-range work. Good definition of all parts of the eye, including edges of eyelids and corners of the eye, is obtainable with these apertures. The depth of focus usually imparts a feeling of roundness and depth which results in a lifelike appearance of the eye. The magnifier, mounted on the focusing attachment, not only aids materially in critical focusing, but also acts in lieu of a focusing cloth, keeping out light while focusing on the ground glass.

Supersensitive panchromatic film is used because of its great speed under artificial light. With this film good photographs may be obtained with one tenth to one twentieth of a second and with the lens stopped down to f:9 or f:12.5.

Focusing on the eye should be made in a room free from illuminated or light-colored objects, other than those used for the direct illumination of the eye. There should be no light entering the windows, no sky-lights nor ceiling lights. Lights used for illumination should be placed in such a position that their reflection in the eye will not interfere with the details to be photographed. It is difficult to illuminate a normal eye for instantaneous exposure with a small lens aperture.

In the case of eyes particularly sensitive to light, the most satisfactory method of illumination is found in the photo-flash bulb, mounted in a reflector, and placed from five to six feet away from the eye, slightly above its level and to one side of it. On the other side of the eye a white reflecting surface is placed to provide even illumination, thus imparting roundness to the picture. Actual focusing is done with a low-wattage bulb placed conveniently near the camera. The shutter of the camera is synchronized with the switch of the bulb and at the moment a sharp focus is obtained the exposure is made.

Fig. 4 (Castroviejo). Arrangement for illumination with spotlight equipped with compur shutter.

Another good method of illumination for sensitive eyes is illustrated in figure 3. A spotlight, equipped with a 1000-watt bulb and a water-cell heat absorber, as well as a system of condens-

ing lenses for focusing and narrowing the beam of light, is placed alongside the patient. The beam of light is directed at the head of the person operating the camera. The operator wears a concave mirror (otological head mirror). The beam of light from the spotlight strikes the mirror and is reflected by it in any desired direction. By moving his head, the operator is in a position to direct the beam of light upon the eye to be photographed for as short or as long a time as is needed. After the camera is focused, the operator, standing behind it, opens the camera shutter, and by a mere nod of his head makes the beam of light pass quickly across the eye. The beam of light needs to remain upon the eye for only a mere fraction of a second. Directly afterwards, the shutter is closed. With a little practice, remarkable ease is acquired, producing excellent results with minimum discomfort to the patient.

Another method of illumination consists of placing the same spotlight alongside the camera, with the beam of light directed at the eye. In this case, use is made of the compur shutter with which the spotlight is equipped, controlled by a cable release. After focusing the camera with the aid of a low-wattage bulb, the spotlight is turned on, the compur shutter remaining closed but set for the desired speed. Opening the shutter of the camera, releasing the shutter of the spotlight, and closing the shutter of the camera require but a moment to perform.

Eyes not particularly sensitive to bright light are photographed with the aid of two 500-watt bulbs in suitable reflectors, provided with tracing-cloth diffusers. One light is placed on each side of the eye; one closer to it and slightly above the level of the eye, four to five feet; the other, farther away, six to eight feet, on the same level with the

Fig. 5 (Castroviejo). Benign tumor of the lower lid.

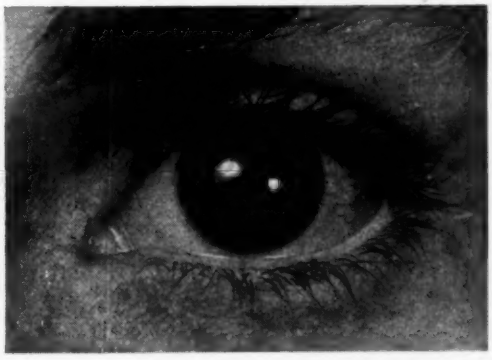


Fig. 6 (Castroviejo). Front view of a normal eye.

Fig. 7 (Castroviejo). Profile of a normal eye.

Fig. 8 (Castroviejo). Congenital coloboma of the iris.

eye. Focusing is again done with the light of a low-wattage bulb conveniently placed near the camera.

Figures 5, 6, 7, and 8 show some photographs of the anterior segment of the eye and adnexa taken according to the above-described technic. A detailed description of the equipment presented above, as well as complete information about handling miniature photographs (developing and printing), is contained in the Leica Manual. This book was to be available in March, 1935.

A SIMPLE DEVICE FOR MEASURING STEREOPSIS

M. DAVIDSON, M.D.
NEW YORK

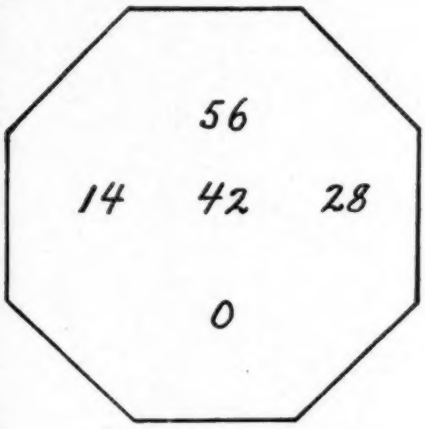
This simple device, which costs very little to make, offers to the ophthalmologist with average equipment a means of obtaining not only qualitative but quantitative clinical records of stereopsis, which are sufficiently accurate to be satisfactory.

The cost and the elaborateness of apparatus for determining binocular, stereoscopic acuity and the minimum resolvable difference of depth deter many ophthalmologists from venturing beyond the mere determination of "qualitative" stereopsis with sterescope, amblyoscope, or bar reader. The reliabilty of stereopsis measurement, using stereoscope and cards designed for the purpose, is questioned by such serious students of the subject as Howard (Amer. Jour. Ophth., 1919, v. 2, p. 656) and Langlands (Experiments on binocular vision, His Majesty's Stationery Office, London, 1929). In the absence of an inexpensive device on the market, a simple arrangement for use at 6 meters, utilizing the standard illumination for test charts has given the writer satisfactory service. Its cost is practically nil; it can be set up with very little effort and may prove of interest to others.

Fig. 1 (Davidson). Side view of the device for measuring stereopsis.

The device consists of 5 white spherical test objects (veil pins, with thin, dark-colored stems, some of which are lengthened for the purpose) set perpendicularly into a dead-black cardboard. The heads of the veil pins available on the market usually run from 2.5 mm. to 4.5 mm. in diameter and their stems are from 3 to 5 cm. long. White-headed hat pins are also available with stems 7 to 8 cm. long and heads 6 to 8 mm. in diameter, but these are objectionable because of the shadows cast by the heads and of the visibility of the stems. I make use of 3.2- to 3.6-mm. test objects. The card is 20 cm. in diameter, octagon shaped, and is mounted on a smaller cardboard box. A replica of the face card is glued to the back of the box for support of the card when standing, and a pivot pin is provided in its center for attachment to the wall of the test-type cabinet, and for revolving the device on its center. The test objects are at 0, 14, 28, 42, and 56 mm. from

the card, and their depth intervals at 6 meters for a pupillary distance of 62.4 mm., varying only slightly with it, are respectively 5, 10, 15, and 20 sec. of arc in terms of stereoscopic acuity. The 42-mm. pin is placed in the center, and the others at 64 mm. from it, vertically and horizontally, and to avoid a semblance of sequence and juxtaposition of extremes of depth intervals, in the following positions:



The wide separation between the center and the wing objects is advantageous in eliminating motion parallax. The 0 and 14-mm. test objects are chosen slightly larger, by 0.1 to 0.2 mm. to overcome the factors of unequal illumination and unequal retinal images. The pins must be perfectly perpendicular to the card and so maintained. The card is placed at the level of the subject's eyes, and by revolving the card through its 8 positions, 4 crosses and 4 quadrilaterals are provided for the purpose of shuffling the position of the test objects. The error of probability by using 5 test objects is very low—1:120 (5 x 4 x 3 x 2 by the law of permutations) and is further reduced by checking up in other positions of the device. The subject faces the card and is not allowed to take advantage of motion parallax while changing the distance at which the test is made.

The examination is conducted in a dark room and is begun at 6 meters. The subject is told that the test objects are at varying distances from him, is given ample time, and is asked to pick out the one nearest to him and the one farthest from him. If he succeeds, he is asked to name the nearest one of the remaining 3, and then of the remaining 2. If correct, he has a stereoscopic acuity of 5 sec. of arc. If he fails at 6 meters, the examination is repeated at 4, 3, and 2 meters; here the acuities are 11, 20, and 44 sec. of arc, respectively. Motion parallax and visibility of pin-stems become a factor at 2 meters and must be guarded against by turning off the lights while the subject changes distance. When in doubt as to whether the subject's binocular depth perception only is involved, exclusion of one eye and repeating the examination disposes of it. A modification of the Perlia objective performance test for "qualitative" binocular stereopsis (Klin. Monatsbl. f. Augenh., v. 12, p. 492), consisting in having the subject bring up or down in the transverse vertical plane a 2- to 4-mm. white spherical test object, mounted on a holder held at 50 cm. or at arm's length, and touch a similar test object held by the examiner, is also useful as a control. If he fails, he has only monocular judgment of depth difference. Touching the 4-mm. objects involves a maximum resolvable difference of depth of only 3 minutes of arc, 0.1 mm. representing about 5 sec. of arc. One-eyed persons, monocular aphakics, ophthalmoplegics in the field of diplopia, normal persons with one eye excluded, and squinters rarely bring the two objects closer than 1 cm. anteroposteriorly. Mild squinters will occasionally pass the test, either in elevation or in depression of the eyes in relation to the normal variation of their deviation, esotropia decreasing in elevation and exotropia in depression. A positive Perlia test can be repeated ad libidum. An occasional accidental touch or contact cannot be repeated after the examiner shifts his test object to eliminate muscle sense.

While, as pointed out by Howard, binocular stereopsis is greatly reduced when the axes of rods are horizontal instead of vertical, no appreciable difference in stereoscopic acuity is found

to exist in using small round test objects placed in the sagittal plane from that found in the use of test objects in the visual or horizontal plane. The difference in the behavior of lines and points, as far as binocular stereopsis is concerned, in the visual and sagittal planes would lend support to the assumption of Bruecke, Javal, Maddox, and others that the main factors in binocular stereopsis are convergence and "visual palpation." This difference can best be explained by the fact that one cannot converge on a horizontal line as one can on a point or a vertical line. The current angular expression of binocular stereopsis in terms of the binocular parallactic angle remains, however, unaffected by the assumption of convergence as the leading factor, since for objects near the visual or sagittal plane, that is, for small angles, the binocular parallactic angle and the convergence-angle difference as measured in meter angles, are the same. To illustrate, by the current formula (Langland) for calculating the binocular parallactic angle, a depth difference of 56 mm. with an interpupillary distance of 64 mm. at 6 meters, would result in $\frac{64 \times 56 \times 206.000}{6000 \times 6000}$ sec., or 20.+ sec. of arc. In terms of meter angles the result would be: 2200 sec. minus $\frac{2200 \times 6000}{6056}$ or 20.+ sec. of arc. The convergence meter-angle formula is of course applicable to objects in the median or sagittal plane, where there is no binocular parallactic angle difference, only disparity. The use of the meter angle rather than the binocular parallactic angle, incidentally disposes of the apparently puzzling relation of the angular expression of binocular stereopsis to the angular minimum separabile for form, since the immediate stimulus from convergence is proprioceptive and not exteroceptive.

A preliminary study of 100 subjects with this device gave the following results: The range of stereoscopic acuities of 80 subjects with 20/20 c.u. was 5 sec. to 44 sec. of arc; 64 percent of these had better than 20 sec. of arc and the average was 22 sec. of arc of stereoscopic acuity. The other 20, with acuities between 44 sec. and 3 minutes of arc suffered from anisometropias, muscle imbalances and subnormal vision in one or both eyes. The average stereopsis threshold in normal individuals is therefore by this device higher than that reported by Howard, Cohen and Wells. The following factors must be considered in accounting for this difference: the use of white objects on a black background; the subjects being principally compensation claimants not particularly interested in the results; the test objects being stationary and multiple; the recognition of a depth difference between the nearest and farthest already implying some vague difference between the others, making perhaps for an individual underrating of acuity.

Subnormal visual acuity becomes an obvious factor in binocular stereoscopic acuity by this device only when the visual acuity is less than 20/200 in one or both eyes, and if combined with moderate anisometropia, when it is 20/100 in one eye. Monocular aphakia gives only judgment of depth difference. These, squinters, and one-eyed persons, regardless of the duration of the condition, have been found by this device, using the same angular expression for comparison and convenience only, since neither convergence nor binocular parallactic angle is involved, to be much less than 3 minutes. Monocular judgment of depth difference may be said to have a threshold ten times as high at least as the binocular stereopsis threshold. It does not seem to improve with practice, except in extremely intelligent persons who cultivate their light sense and accommodation. Fonbeurre (cited by Onfray in his report on La Vision du Relief in the Proc. XIII. Intern. Congr. of Ophth.) found in testing aviation candidates at Le Bourget field, unusual monocular depth-perception acuities, with rods at 6 meters, of as much as 15 mm. or 6 sec. He does not state, however, the separation of the objects in the transverse vertical plane. Since monocular motion parallax operates inversely

with the separation in depth perception, this may have been a factor.

The elementary device described is not a laboratory instrument but is sufficiently accurate, in my opinion, for clinical purposes. The obvious imperfections—unequal illumination of the test objects, faint shadows cast by them and their stems, the visibility of the stems if the subject is allowed to move freely about the room and take advantage of motion parallax, all imperfections which become a factor only when working at less than 3 meter distances —seem to neutralize one another. Some are a possible help, while others are a hindrance to binocular stereopsis. The imperfections could undoubtedly be removed, but the cost would bar its wide use. As described, it costs practically nothing to make.

80 Centre Street.

NOTES, CASES, INSTRUMENTS

REFLEX SPASM, SIMULATING EMBOLUS OF THE CENTRAL RETINAL ARTERY

Secondary glaucoma following antrum irrigation. Complete recovery

WILBER F. SWETT, M.D.
SAN FRANCISCO

The following case is reported because of the unusual sequence of events and of the fact that it was under observation from the onset of the embolism to the restoration of circulation.

The patient, a Caucasian telegrapher, aged 37 years, entered the hospital because of pain and buzzing in both ears for the duration of one month. The physical examination, blood pressure, urine, and blood Wassermann tests were all normal. The ear condition was diagnosed as chronic catarrhal otitis.

On March 19, 1933, the right antrum was washed. It was blown out by air, and the patient complained of sharp pain in the left eye, which was immediately followed by swelling of the lower lid as if water had been injected into the orbit. The patient complained almost immediately of flashes in the right eye and then blindness. He was brought into the eye clinic at once and examined not more than three minutes after the loss of vision. The fundus, at this time, was almost colorless and the arteries completely empty—showing only as fine, pale cords. There was a bright spot in the macula and milkiness of the whole macular region. The eye was massaged vigorously and the fundus examined at intervals. At first the picture remained the classical one of embolus of the central retinal artery, then, suddenly, it was noticed that the arteries seemed to take on a rapid clonic dilatation and contraction with a column of blood advancing and receding with a marked pulsation. As this phenomenon increased it seemed to be transmitted to the veins, so that the whole disc had the appearance of pulsating. This continued for twenty minutes and then the pulsation grew less and less until the retinal arteries had completely refilled and the fundus returned to normal color and appearance. The vision (hand movements) remained very much blurred and the patient was returned to bed.

Thirty minutes later I was called again because of intense pain and headache. There was then a marked secondary glaucoma (tension +++) and the fundus hyperemic. The veins and arteries appeared very much engorged, tortuous, and the whole fundus tremendously hyperemic due, evidently, to a secondary relaxation of the vessels. There were no hemorrhages. The eye was again massaged vigorously until the tension was much reduced, then eserine and hot compresses were applied. This was continued for the remainder of the day and the patient reexamined on the following morning.

Vision had now returned to 20/20 blurred, and the tension and visual fields were normal. The retina and the retinal vessels still appeared engorged

and did not become normal until the morning of the third day. The vision was normal on the fifth day and the patient had no further complications.

The very marked pulsation of the vessels, which made them appear almost to jump in a clonic spasm, was most striking. As the blood column became reëstablished the pulsation diminished until the circulation was completely restored. The secondary glaucoma evidently resulted from a rapid secondary relaxation of the vessels, as was described in the tremendous engorgment at the time the tension was highest. Recovery was phenomenally rapid when one considers the marked alterations of pressure, retinal ischemia, and engorgment over such a relatively short period.

If the patient had been seen an hour or so after the onset the diagnosis would have been a typical case of embolus, but having been seen immediately after occurrence and watched until recovery it was possible to make a correct diagnosis of reflex spasm of the central retinal artery.

490 Post Street.

A MODIFIED STEREOSCOPE

J. B. Feldman, M.D.
PHILADELPHIA

The benefits of orthoptic training with the stereoscope or an instrument of like construction, can be greatly enhanced by the technician's ability to keep watch of the eyes of the patient during treatment. By this method one can note the constant presence of binocular fixation and the moment either suppression or "spurious binocularism" presents itself.

Thus far no instrument made in America has taken serious cognizance of this very important factor in the training of squint cases. Knowing that constant watch of the patient's eyes is important, some oculists have removed a portion of the upper surface of the eyepiece of the stereoscope to obtain a view of the patient's eyes during training. The results obtained by this method however are not entirely satisfactory. The instrument to be described makes it possible to keep the patient's eye under constant observation. In addition it includes the important adjunct in orthoptic training, "retinal massage," which has proved so effectual in the use of the synoptophore. Bearing these two important features in mind we have constructed for use at our hospital the following modification of the stereoscope.

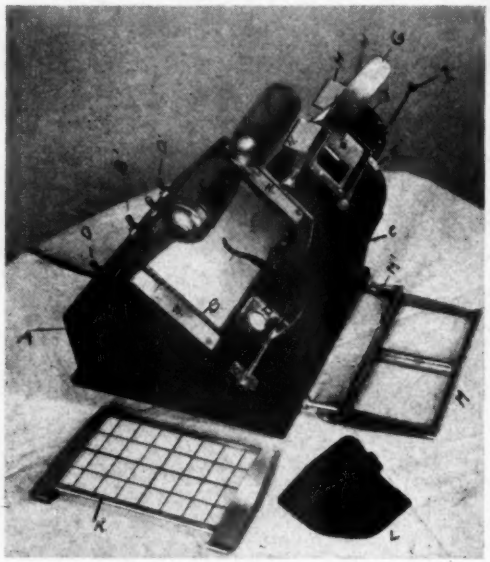


Fig. 1 (Feldman). A modified stereoscope.

The case, A, has a portion of its upper anterior surface cut out. A ground glass suitable for the use of transparent slides is inserted in frame B. B′ is the switch controlling the light behind the ground glass. On both sides of the partition, C, are small circular openings, D, with the light in back controlled by switches, D′. These are placed 60 mm. apart. The width of the circular openings is 18 mm., giving a fusion distance of between 60 and 100 mm. The glass covering the light is of daylight quality and encased in a frame to permit the use of metal discs on which are cut out words or letters for fusion; as for example TO—ON to form TON, and F—L to make E, etc.

E is a lever at the end of which may

be placed a removable circular colored glass disc, in a holder. These come in pairs, of complementary colors. When one color is placed on one side of C and lever E is turned down, and a similar procedure is employed on the other side with its complementary color, color fusion is obtained.

Two small lights, F, placed in holders for use on the stereoscopic and duction cards as well as for cheirographs, are controlled by switch F′. All lights operate on ordinary house current.

G is a head rest. Two flat mirrors, H, are easily adjusted to each eye separately by thumb controls, H′. This enables the technician readily to see the reflex on the cornea of the patient.

I is a rod movable to either right or left. A notch seen in the center of rod, I, clicking into I′ places a Crookes filter No. 2 between the two oculars. When it is necessary to cut down the light to one eye, the Crookes glass can be placed before the eye desired.

Two 5.5 spherical lenses cut to give a prismatic effect of 8 prism diopters occupy the position of the eyepiece with a place in back to accommodate any other lens which may be necessary.

K is the reverse side of an opal glass. When a paper is placed upon its unruled side, no squares are seen. This glass is useful in determining the amount of hyperphoria, since the squares are visible when the switch, B, is turned on, illuminating the glass from behind. Each square is 20 mm. wide.

L is the separator used in cheirographic drawings and is easily inserted in the clip on the inner edge of partition C. M is the holder adaptable for all slides and giving micrometric movements in and out. This holder is useful in accurately measuring duction as well as obtaining retinal massage. N is the holder for K and M.

The instrument can be easily and cheaply constructed and has been found of great service in our clinic.

N. E. Cor. 20th and Chestnut Streets.

SOCIETY PROCEEDINGS

Edited by Dr. H. Rommel Hildreth

COLORADO OPHTHALMOLOGICAL SOCIETY

October 20, 1934

Dr. James W. Lamme, presiding

Perforating injury of the globe, iridodialysis and possibly subconjunctival dislocation of the lens

Dr. V. H. Brobeck presented the case of J. C., aged 35 years, who was injured on April 21, 1934, when he was struck in the right eye by a riveting hammer. Many sutures were required to close the wound in the upper lid, which extended from the temporal rim of the orbit to the middle third of the tarsus. Orbital cellulitis developed, and later a fragment of bone presented through the wound.

When he was first seen, two weeks following the injury, there was marked ciliary injection, and an area of iridodialysis above from "10 to 2 o'clock." The cornea was moderately hazy, the lens dislocated, and the vitreous so cloudy that fundus details were not discernible. The lens could not be seen floating in the vitreous.

In June, six weeks later, the tension rose to 38 mm. (Schiötz) in this eye. The vitreous had cleared and the posterior segment was apparently intact. The tension was controlled with pilocarpin and the ptosis was improving. The vision with +10.00 D.sph. was 0.5.

The remarkable feature in this case was the subconjunctival dislocation of the lens where it now reposed over the external-rectus muscle.

Discussion. Dr. G. H. Stine asked if there had been any change in the appearance of the outer aspect of the globe since the patient was first seen. He was not at all certain that he could see anything other than possibly a slight protrusion of the sclera at the alleged site of the expelled lens. He felt that the lens had been either completely expelled from the eye or might possibly be lying in the far periphery of the fundus.

Optic atrophy and multiple sclerosis

Dr. V. H. Brobeck presented the case of Mr. S. W., aged 34 years, who gave a history of sudden loss of vision in the right eye ten years previously, which was recovered within two months. There was diplopia for a short time in 1929, in October, 1933, and again on January 1, 1934. When first seen in December, 1933, the conjugate movements of the two eyes were limited to a circle of about ten degrees. Repeated efforts to bring about fuller rotations were unsuccessful. The patient was watched for a long time to exclude malingering. There was fine tremor of the head, scanning speech, nystagmus in all directions of the gaze, intention tremor, exaggerated reflexes, four or five cells in the spinal fluid, and zone-one colloidal gold curve. The right optic nerve showed considerable temporal pallor which had developed in the past two months. The appearance of the left eyeground was normal, as had been the case with both eyes at all previous examinations.

Bilateral subconjunctival lymphoma

Dr. J. J. Pattee presented the case of N. S. P., aged 36 years, married, cabinet maker, who consulted him first on October 13, 1934, for a troublesome epiphora of both eyes which had begun in the left eye one year ago, and six months ago in the right eye. It had become progressively worse and was aggravated by wind and storms. The patient's refraction had been tested two months previously by an optometrist; he obtained no relief. He had had an ulcer on the left cornea in 1919, and another in 1931. The family history was irrelevant.

External examination revealed large, smooth, injected masses in the lower fornices of both eyes. The mass in the left lower fornix was the larger, meas-

uring 10 by 22 by 5 mm., while that in the right lower fornix was about one-half as large. They were dark red, smooth, firm, immovable, subconjunctival masses. There was some swelling, also a slight degree of dark discoloration of the temporal half of the left lower lid. In the region of the caruncles were red, soft, irregular lymphoid folds beneath the conjunctiva. It was these masses that embarrassed the puncta, thus causing the epiphora. The right and left preauricular glands were considerably swollen, and the retromaxillary and cervical glands moderately enlarged. The tonsils were also somewhat enlarged, particularly at the lower poles, and the lingual tonsil was thickened. The patient was referred to an internist for a general physical examination. His weight was as usual, 145 pounds. He had worked regularly, but was tired and caught cold easily. The cervical and inguinal glands and the spleen were slightly enlarged. The blood pressure was 108/80. There was a partial denture in the upper mouth, and seven teeth had numerous fillings. There had been no dental care for three years. The lungs, heart, kidneys, rectum, and prostate were normal. The urine was normal, as was the blood Wassermann and Kahn. The blood examination was as follows: red cell count 4,850,000, white cell count 18,500, lymphocytes (mature) 60, lymphocytes (immature) 13, endotheliocytes 7, irritation cells 0, polymorphonuclear neutrophiles 18, polymorphonuclear eosinophile 1, polymorphonuclear basophile 1, myelocytes neutrophilic 0. Hemoglobin was 80 percent (instrument) Dare; color index 0.82. Blood plates were reduced. A biopsy was done on both eyes, and under the microscope the tissue was seen as a structureless mass of lymphoid cells. The tentative diagnosis by the internist was a blood dyscrasia or a disease of the lymphatic glands.

Conjunctival pemphigus; improved following administration of Brooks's hemoprotein

Dr. E. R. Neeper reported the case of Miss D. C., aged 59 years, who consulted him first on September 7, 1934. The patient had been examined ten days previously by another ophthalmologist who found questionable pneumococcus conjunctivitis; the tension had been found to be moderately elevated in both eyes. One-half percent pilocarpin had been prescribed, and the patient complained that it was very painful whenever used. When first seen most of the lower half of the right upper lid was denuded down to the tarsus, giving a white appearance to the everted lid. A similar condition prevailed on the globe, the lesion extending from the limbus at about "4 to 5:30 o'clock" downward almost to the fornix, being about 5 mm. wide in its central portion. There was an ulcer of the cornea involving three fourths of its surface. The rest of the conjunctiva was highly engorged. The pupil measured about 1.75 mm., and was rather inactive, the iris was hyperemic. Two days later the aqueous was turbid. Under homatropine the pupil dilated to about 3 mm., and the eye was more comfortable. Hemoprotein (Brooks) was used subcutaneously, and had been continued ever since.

Homatropine was replaced by atropine after five weeks. Twenty-two days after the first visit blood was noted on the cornea and beneath the epithelium where a bleb had formed and ruptured, breaking a pannus vessel near the limbus. The subepithelial clot persisted for nine days. One week after the appearance of the first bleb another corneal bleb was noted, but it disappeared within twenty-four hours. On the twenty-seventh day of treatment a granular-appearing subconjunctival elevation was noted on the healed, fairly smooth upper lid. This was followed by two additional elevations closely adjacent. A few days later the elevations had become confluent. The lesion measured 4 by 1.5 mm. and was elevated about 2.5 mm., lifting the lid from the globe. This mass seemed highly irritant to the denuded cornea. It broke down first at its apex and absorbed after about two weeks. Much white stringy secretion was present during the early days of treatment. The upper lid now showed cicatricial grooves and prominences.

At the time of reporting the eye had definitely quieted down, and the present kindly inclination in every way indicated early healing unless there were recurrences.

Retinal detachment cured by Walker's method of micropuncture operation

Dr. G. H. Stine presented the case of Mrs. C. W. G., aged 56 years, first seen on April 25, 1934, with the complaint of light flashes and floaters in the left eye. A past history was elicited of vitreous opacities and possibly a small retinal detachment, probably macular in the right eye in 1931. This disappeared within three weeks under medical treatment.

A large cobweb floater was seen in the left vitreous, and the periphery of the fundus in each eye was sown with small, old choroiditic spots. The general physical examination revealed chronic cholecystitis and peridental infection. The vitreous opacity in the left eye cleared within the next three weeks, to be followed by a relapse with sudden blurring of vision about a week later. There was in the left eye a large, dense vitreous opacity along the hyaloid canal and spreading out morning-glory-wise just behind the lens. The periphery of the fundus was clearly seen, but the disc and posterior pole were only faintly visible. The vision in the left eye was 0.2. The patient was given a course of sweats, bed rest, mercury and iodide, and treatment of the dental infection and gall bladder condition was instituted.

By June 5, 1934, there was considerable clearing of the vitreous, with a vision of 0.3. There was no evidence of retinal detachment. Two weeks later a large bullous detachment of the upper retina was seen by Dr. Neeper; it apparently had developed suddenly the day before. The patient was sent to bed, and was seen by Dr. Stine about three weeks later when there was positively no retinal detachment. The vitreous was much clearer, the large opacity being broken up into residual, small, black dots in the center of the vitreous. The vision was 0.4 in the left eye. Nine days later an injection of foreign protein (Coley's mixed toxins) was given, and followed by a severe reaction, with vomiting, the vision of the left eye being reduced to 0.2. The macular retina was cloudy and slightly edematous. Four days later there was a sudden development of the retinal detachment in the upper and nasal quadrant of the globe, with a large horseshoe-shaped tear at about sixty degrees on the twenty-degree meridian above the horizontal line. The patient was put to bed and pupil glasses ordered; she had been under atropine continuously since first seen. Some subsidence of the detachment during the next three weeks was noted.

Walker's diathermy micropuncture operation was done on August 13, 1934. A barrage of eleven small pins was placed behind the equator, between the superior and internal recti muscles, with three rows from thence forward to the ora serrata. This resulted in the reattachment of the retina anterior to and including the anterior lip of the tear, but the detachment posterior to the tear and below persisted. The operation was repeated about two weeks later, but owing to a breakdown of the diathermy machine it was impossible to do more than give a light diascleral treatment (Larsson) and a posterior sclerotomy, without effect. Secondary tears with a small hemorrhage developed in the lower retina, and the detachment spread into the lower temporal quadrant and slightly into the upper quadrant of the disc. About three weeks following the second operation the patient was seen in consultation by Dr. Clifford Walker. The third operation was performed on September 17, 1934, at which time forty-three micropunctures were made in the nasal side of the globe between the nasal edge of the superior rectus and nasal edge of the inferior rectus, 15 to 20 mm. behind the limbus. The postoperative course was uneventful, except for an increase in the vitreous opacities. Ten days later the retina was completely reattached and the vitreous clearer. There was a diffuse gray choroidal turbidity with some scattered pigment in the nasal fundus at the site of the punctures, the most posterior of which were

seen three to four disc diameters below and nasal to the disc. Since that time the fundus and vitreous had gradually cleared, and the vision at the time of presenting was 0.2 uncorrected.

Dr. Stine said that he considered his results with this operation in the treatment of retinal detachment to be quite satisfactory. To date he had operated in six cases with four cures; one improvement, and one failure. In the case showing improvement, one operation had been done and he planned to do a second one. In the case in which the result was nil following one operation, failure was due to a massive vitreous hemorrhage the night after the operation. The patient had been successfully operated on for senile cataract in both eyes, and had a retinal detachment of many years' standing in the other eye. He had advised a second operation, but the patient had not as yet consented.

Magnetic intraocular foreign body

Dr. G. H. Stine presented the case of D. S., aged 16 years, first seen on September 11, 1934, who gave a history of having something strike the left eye two or three weeks previously while hammering a nail. On external examination there was found a very faint branching healed scar in the upper temporal cornea. There was a ragged hole in the iris, a very small, linear opacity in the anterior lens capsule with a slightly opaque track through the lens substance, and a small, glassy bead jutting into the retrolental space, in all probability herniating lens cortex. A few microscopic brownish specks were visible in the track through the lens substance. The vitreous and fundus appeared perfectly normal except for a small pigmented area down and out from the disc. There was a dark, oblong, glistening, foreign body below the disc in contact with the retinal surface. The X-ray verified the ophthalmoscopic findings, showing a foreign body .5 by 1 mm. in size.

On September 21, 1934, the foreign body was removed with the hand magnet through a meridional posterior sclerotomy in the lower temporal quadrant just behind the equator. The patient was given 25 million typhoid vaccine intravenously that night. The postoperative course was relatively uneventful up to five days after the operation. The next day, however, just temporal to the meridional white sclerotomy scar, there was a dirty-gray, smooth, moderately elevated area about two disc diameters in diameter, beginning at the temporal edge of this scar. There was a faint ring of hemorrhage around it. The wound itself appeared normal. The patient was given foreign-protein injections, pilocarpin sweats, and kept under atropine and pupil glasses. The eye improved and remained quiet externally until October 9, 1934, when a faint cloudiness of the vitreous directly over the choroidal detachment was noted. No hemorrhages were visible. The patient was again given foreign-protein therapy and placed on iodide and mercury. When seen nine days later there was little change externally, the vision was 0.7, but there was increased vitreous haze over the area of the choroidal detachment, so that the sclerotomy wound was only faintly visible. In all probability the choroidal detachment was due to bleeding in the suprachoroidal space, and minute retinal hemorrhages were possibly the cause of the vitreous opacities.

Small round-cell sarcoma of the left orbit; extensive X-ray therapy with definite improvement

Dr. G. H. Stine presented N. C., aged 12 years, whose case was reported before a previous meeting on January 20, 1934. The patient had had extensive X-ray therapy following an unsuccessful surgical attempt to remove a mass in the upper orbit. A total of 7,535 roentgens and 150 milligram hours of radiation was applied over a period of nine months through five ports of exposure, which were varied from time to time, with marked temporary improvement. The parents refused exenteration of the orbit. Considerable dermatitis and conjunctivitis followed radiation, but were subsiding. The vision fluctuated between 1.2 and .03, and at the time of presentation was 0.4. There was now slight increase in the propto-

sis. There was no definite limitation of the rotations, and the pupillary reactions were normal. The fundus was negative, but poorly seen. There had been no increase in the intraocular tension, and no iritis. The prognosis was extremely guarded, although there was no definite evidence of metastasis as yet. Possibly there was a soft mass slightly palpable above the globe.

George H. Stine,
Recorder.

ROYAL SOCIETY OF MEDICINE, LONDON

Section of Ophthalmology

November 9, 1934

Mr. Ransom Pickard, president

A successful corneal graft

Mr. J. W. Tudor Thomas said that his patient's vision had been improved from inability to see more than hand movements, to a capacity sufficient for him to find his way about London unaided.

The man, aged 57 years, a resident of New Zealand, when 17 years of age suffered from corneal ulcers, which left him with central corneal opacities and very defective sight. Seventeen years ago the eyes again became ulcerated.

At the present time the vision in the right eye was limited to finger-counting at 15 inches. In the left eye there was no vision beyond detecting hand movements. The anterior chamber was apparently normal.

A piece of cornea was removed from the donor's eye measuring 4.3 mm. in diameter and at once placed in a watch-glass bath of olive oil. The margin of the graft was cut in a shelving manner. Two cross sutures were inserted, and a citrate solution with adrenalin was used to prevent adhesion of the iris. The pupil was small, and was in the center of the corneal opening. The lens was clear.

The eye progressed well. There was present a slight mucoid discharge. The sutures were removed on the 8th day, and at 14 days the graft was clear, with the exception of one minute spot, white in color, near the lower margin. In the shelving margin a few small blood vessels took a circular course. From the 8th to the 20th day the eyes were bandaged. At three weeks the white dot was still persistent. The patient left the hospital in a little over a month. On the 35th day vision was 3/60, and in seven weeks he could read 4/60. For two months he had been going about London by himself, but there was still a separate white nodule on the iris. The small corneal opacity 1 mm. long was shrinking in size. The patient's blood pressure was always somewhat high, and if this was increased the eye became red but would quickly subside after two days' rest in bed.

The summary of cases to date showed that sixteen had been treated by transplantation of the cornea; one just a week ago. Of the remaining, five were not quite suitable cases. In one of the ten suitable cases the grafting was successful but the pupil was small and did not correspond with the center of the graft. The others could well be described as successful cases, the standard of success being considerable improvement in vision, and the graft retaining a considerable and lasting degree of transparency.

Preoperative preparation of the conjunctival sac by ultraviolet rays

Mr. F. W. Law said that patients awaiting intraocular operations harbored in the conjunctival sac organisms which were either definitely pathogenic, or were likely to become so, and would certainly behave in a harmful way if introduced into the eye. The procedure to be described was one of preoperative preparation, in contradistinction to sterilization, because to permit of safe operation removal of all the conjunctival flora was not needed. Irradiation of the conjunctiva did not usually result in a complete sterilization but pathogenic organisms were more susceptible to this agency than the nonpathogenic ones. In most of the cases referred to him for this treatment, other methods had been tried for cleansing the sac, but without success.

A lamp on a movable stand was used.

The head of the patient was mechanically secured, and the lids were everted in such a way as to cover the cornea. The sittings were given at intervals of two days.

Of a series of 20 patients, 8 showed extermination of the pathogenic organisms, and after the operation the convalescence was normal. In one of the cases a culture taken from the conjunctiva had been showing pneumococci and the staphylococcus aureus for six months. All methods of cleansing except ultraviolet had failed. In two cases the conjunctival sac was rendered sterile but it was not convenient to do the operation at once, and when two days later it was about to be performed, infection was found to have occurred. This suggested that the method did no more than attenuate the organisms and inhibit the growth of fresh ones. In two cases there had been pneumococci in the sac, and the operation was carried out, with good results.

His conclusions were: 1, ultraviolet-ray irradiation was successful in nearly every case in rendering the eye bacteriologically safe for operation; 2, pathogenic organisms proved to be more susceptible to the rays than were nonpathogenic ones; 3, even if the pathogenic microorganisms were by this means only attenuated, operation on the eye could be carried out with safety; 4, it was not advisable to combine with irradiation the application of antiseptic lotions and silver nitrate.

Discussion. Mr. A. C. Hudson said that efforts had been made to clear the conjunctival sac of all contaminations by means of the tungsten arc lamp. Such applications had been done at St. Thomas' Hospital by Dr. Bowen, and the few results obtained were encouraging. The organism most to be feared in these cases was, he considered, the staphylococcus aureus. In former days it seemed quite hopeless to convert a conjunctival sac invaded by this organism into a suitable state for operation.

Mr. G. Handelsman related a series of cases in which he had had success with ultraviolet treatment. No success followed the application of the rays in cases of chronic blepharitis of long standing.

Rupture of Descemet's membrane from a contusion

Mr. F. A. Juler presented a man, aged 39 years, who came for advice because of symptoms of conjunctival irritation, in 1930, and attended for the same in the present week. The condition in the left eye was noted during a routine examination. The man himself dated it from a war injury, in which he was thrown from a car by a bursting shell. There had been considerable bruising on the left side of his face. His left vision was now 6/6 partly, and this cornea showed a sinuous line on its posterior surface: it did not reach the limbus. From this a shelf projected back into the anterior chamber, evidently formed by Descemet's membrane. There was a thinning of the posterior layer of the cornea corresponding to the previous bed of the shelf. In two places there were seen to be some rounded globules growing from the posterior corneal surface in the shelf area. He said that in the birth-injury cases of Descemet's membrane rupture, there had always been a high astigmatism.

(Reported by H. Dickinson)

MINNESOTA ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

Section on Ophthalmology

November 9, 1934

Dr. J. S. Reynolds, president

Conservative treatment in removal of intraocular foreign bodies

Dr. L. W. Morsman (Hibbing, Minnesota) stated that his experience of the last seventeen years had taught him not to be in too big a hurry to remove such foreign bodies. When a patient came to him with an intraocular foreign body, he was sent to the hospital where both front and lateral x-rays were taken of the eye and the patient was put to bed. As soon as the inflammation had subsided the patient was allowed to go home and report to the

office. A planned operation was later performed to remove the foreign body.

Dr. Morsman then demonstrated, by the use of a flexible nasal probe, his method of localizing a foreign body in the x-ray films. He bent the probe into a hook and placed it over the temporal region, level with the center of the eye in such a way that the forward point was exactly in line with the anterior surface of the cornea. The probe now was firmly strapped to the patient's face in this position with adhesive tape. He then placed the patient's head on a Buckey diaphragm, the injured eye downward. The picture was taken at right angles to the plate and exactly in line with the center of the plate. The patient's eyes were both kept open and were fixed on an object held by the doctor.

He would then make a loop of the end of this probe, the shape and size of the eyeball, place it over the lids in front, and take a second x-ray from the back. On examination and comparison of the two films, the foreign body could be located with exact reference to its position in the eye.

Discussion. Dr. W. L. Benedict (Rochester) thought that Dr. Morsman was justified in delaying the removal of foreign bodies in some cases in which extraction was rather difficult. In his experience he had found, that when he had tried to extract a foreign body rather soon after it had entered the eye and had failed, and after two or three days he had tried again, it came out quite easily. He believed that one could combat infection with a foreign body in place as well as after extraction of the foreign body; and on the whole there were more advantages to be gained by allowing the eye to recover from the shock of the injury than to go ahead and add more injury to it.

Sarcoma of the ciliary body

Dr. E. R. Bray (St. Paul) presented Mrs. S. O., aged 44 years, who came to the office on October 17, 1934, complaining of seeing black spots in front of the left eye for the previous three weeks. She had never used glasses. On that date her vision was: right eye 20/15; left eye 20/25.

The external appearance of the eyes was normal except that dilated bluish blood vessels were noticeable over the temporal sclera of the left eyeball. Pupillary reactions were normal. The right fundus was normal. The left fundus showed a growth apparently attached to the ciliary body and extending down and attached to the outer wall of the eyeball. The growth was pinkish in color and well supplied with blood vessels. The patient was examined by an internist, who found her general health normal. The Wassermann was negative.

After repeated examinations of the eye it was decided that the left eye should be removed. Preliminary to its removal, the patient had had four x-ray treatments by Dr. Stenstrom at the University of Minnesota Hospital. His recommendation was to wait four weeks after the final x-ray treatment before removing the eye as by that time the inflammatory reaction from the x-ray treatment would be over.

Discussion. Dr. W. L. Benedict (Rochester) preferred the name melano-epithelioma; the structure was very similar to sarcoma. As Dr. Larsen brought out, there were differences in the malignancy of such tumors. Some of the tumors that were deeply pigmented were not malignant. He cited the case of a boy operated on five years ago for melanotic tumor of the right orbit with marked pigmentation of the conjunctiva, deep pigmentation of the lateral wall of the side of the nose and hard and soft palates. This pigmentation had been noticed from the time he was five or six years old and the boy was 15 when he came to Dr. Benedict. When the orbit was exenterated five years ago there was a mass in the back of the orbit which had the consistence and color of tar. This boy had recovered.

Radium or x-rays had been given to only five patients who had melano-epithelioma of the iris and ciliary body. One patient seen in 1919 was still living in 1927; another seen in 1924 was living and well after two years; another seen in 1930 had some x-ray treatment after enucleation but, unfortunately,

Dr. Benedict had no subsequent report on that case. Another patient was seen in 1919 when the eye was removed and 20 mg. of radium was put into the socket. The patient had eight subsequent x-ray treatments between January and December and yet had developed metastases to the liver. Another man, whose eye was enucleated in March of 1927, died in 1929 of abdominal metastases.

Of a total of 83 patients from whom eyes had been removed, Dr. Benedict now had reports on 28, living from 6 months to 11 years after removal of the eye. Seventeen were known to be dead. Unfortunately there were 38 on whom he had no recent report. Dr. Benedict said they had had little experience with radiation for intraocular melano-epithelioma but, judging from the effects of radiation on similar tissue in other parts of the body, he would say it was a waste of time. He felt one was perfectly justified in saying that, once he was quite sure there was a melano-epithelioma or sarcoma within the eyeball, the eye should be enucleated immediately.

Dr. W. W. Lewis (St. Paul) said he had seen this case with Dr. Bray and was very much impressed on account of the possibility of missing at examination what this eye contained.

Retinitis pigmentosa

Dr. Forrest F. Slyfield (Duluth) reported two cases of nyctalopia in a brother and sister. The boy, 18 years old, was first examined on October 1, 1932, and last seen on July 20, 1934. It was stated that since he first began to walk, it was difficult for him to see at night. One sister, 17 years of age, was affected in the same way and had the same poor vision at night. All the children in the family, two daughters and one son, were bright, studious, and normal physically in every other respect. These children had consanguineous parents, the mother of the children having married her uncle.

On examination, the external appearance of both eyes of this boy was normal and the lids were normal. Corrected vision (myopia) was right eye 20/45; left eye 20/50. The fundus presented a definite retinitis pigmentosa. The fields of vision were very contracted for both eyes and the blue field was inside the red field.

The second patient was a girl 17 years of age, sister of the first patient. She was first seen on November 17, 1930, and last seen on July 20, 1934. The history of this case was the same as in the brother's case just given.

The external appearance of both eyes was normal and the lids appeared normal. The fundi were similar to those of the first patient. Corrected vision (myopia) was right eye 20/40; left eye 20/40.

The fields of vision were very contracted for both eyes but not to the extent found in the case of her brother; the blue field was inside the red field.

Angioid streaks of the retina associated with pseudoxanthoma elasticum

Dr. Anderson Hilding (Duluth) said that the first report of angioid streaks of the retina was made by R. W. Doyne in 1889. Since then, up to 1932, there had been some ninety cases reported in the literature, but it was not until 1929 that the relation between the skin disease called pseudoxanthoma elasticum and angioid streaks was first suggested by Ester Grönblad. Since that time the simultaneous occurrence of both in certain patients had been reported and a causative relationship suggested by a number of observers. Ester Grönblad had summarized and correlated all that was known about angioid streaks up to 1932 in an extensive treatise published as a supplement to the Acta Ophthalmologica.

Through her studies she arrived at the following conclusions: Angioid streaks were not vessels, nor were they caused by hemorrhages or folds in the retina. The streaks were ruptures in the lamina vitrea and inner layers of the chorioid due to a degenerative process that attacked elastic tissue. It was the same degenerative process that attacked the elastic tissue of the skin to produce pseudoxanthoma elasticum. The hemorrhages which appeared in the fundus were secondary. Angioid

streaks were, therefore, a localized manifestation of a systemic disease. This disease was an atrophic or dystrophic process of elastic tissue. It seemed to be hereditary.

The fundus picture varied tremendously, but in general presented certain characteristics. A well-developed case usually showed an area of choroiditis about the discs from which radiated the streaks that gave the disease its name. These streaks might be broad or narrow, branched or unbranched, distinct or faint. They varied in color from gray through brown to red. They often extended to the equator where they ramified and ended. Hemorrhages were common, especially about the macula. Irregular exudates and areas of pigmentation were also frequent. When the streaks crossed the course of a vessel it was seen that the vessel lay superficial to the streak.

Dr. Hilding's case was that of a 35-year-old Polish woman, first seen on August 31, 1933. She had been seized with a violent headache and her vision was diminished. Upon examination it was found that her vision was 20/100 O.U. The external examination of both eyes was entirely negative. Both fundi exhibited well-developed pictures of angioid streaks, the left more advanced than the right. Both showed a degenerative choroiditis about the disc, from which radiated irregularly sized and shaped brownish streaks. The retinal vessels coursed over the streaks and appeared to be entirely normal. There were hemorrhages about both discs and both maculae, some of which were obviously interfering with vision. Just above the left macula there was found a circumscribed bluish-white exudate, about half the diameter of the disc, that suggested a tubercle. The Wassermann test and extensive blood and spinal-fluid studies were entirely negative. The only positive findings were three dead teeth and some peculiar skin changes on the arms, shoulders and neck, which the patient stated were powder burns. No cause for the violent headache was found.

Later he again examined the powder burns on the patient's arms, shoulders and neck. When examined closely, it was clearly seen that there was a symmetrical band of pathological skin about the neck and a patch in each axilla that was distinctly different from the brown powder marks upon the arms, shoulders, and back of the neck. In a word, the former were typical lesions of pseudoxanthoma elasticum and corresponded exactly with the textbook picture.

Discussion. Dr. H. P. Wagener (Rochester) said the most complete study of these cases in the American literature had been the report of Dr. Clay of Atlanta. Mild changes of this type were apt to be overlooked or at least not fully investigated. Many ophthalmologists doubtless had seen these cases and had had, but missed, the opportunity to establish the association of angioid streaks with pseudoxanthoma elasticum, which association was first brought out by Grönblad.

Dr. Wagener did not believe that there was a constant association of angioid streaks with pseudoxanthoma elasticum. At least some patients with angioid streaks did not have the skin lesions at the time the angioid streaks were found, and some patients with well-advanced pseudoxanthoma elasticum did not show angioid streaks. It might be true, however, that the association of the two lesions would ultimately be found if the patient was observed over a long enough period of time. He felt that by far the greater number of angioid streaks seen were apparently innocent lesions so far as their effect on vision was concerned. However, all angioid streaks seemed to be associated with visible damage to the choroidal circulation, though this was often apparently slight. One of the first theories of their origin was that they were the residues of choroidal hemorrhages.

So far as Dr. Wagener knew, there had never been a histologic examination of clinically observed angioid streaks. In Verhoeff's case, the lesions were found only on histologic examination. Verhoeff described the lesions as a sclerosis and contraction of the choriocapillaris with a resultant folding of

the pigment epithelium of the retina. It seemed difficult to correlate this vascular pathology with the pathology of pseudoxanthoma elasticum, which seemed to be a primary degeneration of the elastic tissue of the skin. In the eye there should be a primary degeneration of the lamina vitrea of the choroid. Yet, ophthalmoscopically, the lesions seen in association with angioid streaks seemed to fit in with Verhoeff's histologic findings of a primary lesion of the choroidal circulation. If this were true, it was difficult to understand why they should be associated with pseudoxanthoma elasticum, which had no associated vascular lesions.

Since Grönblad's and Clay's work, the association of angioid streaks with Paget's disease of the bones had also been noted.

Monocular diplopia

Dr. R. C. Smith (Superior) stated that the patient was first seen on May 7, 1930. While at work pouring molten babbitt into a drill hole in concrete, the babbitt exploded, due to the moisture in the hole, and flew up into his face. He was immediately taken to his physician who removed three pieces of babbitt from the right eye.

When examined, the conjunctiva of the right eye was found to be injected. A large piece of babbitt was removed from the lower cul-de-sac. The patient was hospitalized for a week. The cornea apparently was clear, the vision 20/30.

The patient later complained of monocular diplopia and some difficulty arose about compensation. Careful slit-lamp observation then showed tiny metallic particles in the cornea.

Discussion. Dr. D. L. Tilderquist (Duluth) stated that it was possible to have a monocular diplopia in an apparently healthy or uninjured eye. When there was a complaint of diplopia in one eye after an injury, it might be well to keep in mind that it was possible that the diplopia had existed before the injury took place.

Dr. K. C. Wold (St. Paul) said there had been cases reported in which there was a double fovea with reversion to type. It was just possible there might be some condition in the retina itself which explained the monocular diplopia. In quite a few cases of monocular diplopia there was no demonstrable lesion. Dr. Wold felt that Dr. Tilderquist's case might be explained on this basis of double fovea, particularly since it was in both eyes.

Metastatic adenocarcinoma of the left eye

Dr. F. N. Knapp (Duluth) said that the patient, Mr. W. N. N., was 39 years of age.

On January 1, 1934, he had had some constant, severe pain in the left eye. There was a positive scotoma of the left eye which he described as being to the right side of his vision. There was no increased intraocular tension. The left fundus revealed a whitish pale area in the upper temporal quadrant from the temporal superior vessels toward the periphery. This area was elevated two to four diopters. Vision to the right was lost in the left eye.

On February 5, 1934, the patient was taken to the hospital for resection of ribs on the right side. For about six months he had been ill with lesions of the lungs. Necrotic lung tissue and pus were removed. The patient died March 1, 1934.

The posterior half of the left eyeball was removed at autopsy and metastatic adenocarcinoma in the choroid found. The primary tumor was in the lung.

Walter E. Camp,
Secretary

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* Deceased.

STRABISMUS AND REFRACTION

Binocular co-ordination of the two eyes is a visual function of late development in evolution; and in man it seems very susceptible to disturbance. No amount of theorizing about the essential basis of strabismus can disguise our real ignorance as to its causation.

We blame many cases of convergent strabismus upon the excessive accommodative effort required for overcoming hyperopic and astigmatic defects; and the truth of this supposition is found in the promptness with which patients often recover upon wearing an adequate refractive correction.

Yet a few cases of convergent strabismus are accompanied by no significant error of refraction, and the majority of patients with considerable hyperopic and astigmatic errors are not strabismic. So that all we can safely assert is that strabismus appears in those whose power of or impulse toward binocular fusion is subnormal and easily upset, and that failure of such fusion occurs most readily in the presence of hyperopic defects.

With regard to divergent strabismus the situation is more hopeless, for this disorder is rather commonly accompanied by little or no refractive error, and it often persists more or less intermittently in spite of the most careful correction of such error.

It is none the less true that in dealing with any case of strabismus, especially of the convergent variety, the first step is a very careful measurement and correction of any appreciable refractive error. Unfortunately, important and puzzling differences of method are to be encountered as to the technique for refractive correction in such cases.

The commonest mistake is made by those who have been taught that in every case of hyperopia the correction found under cycloplegia must be reduced by an estimated allowance for supposed latent hyperopia. In other words, some refractionists never, even in a case of convergent strabismus, pre-

scribe a full correction for the amount of hyperopia found under cycloplegia.

When the patient has thus been given an incomplete correction under which his convergent strabismus persists, it is too often assumed that the case is not amenable to nonoperative treatment, and advancement or shortening of the externus, recession or tenotomy of the internus, or a combination of such operations is performed, the operative intervention often including both eyes.

Perhaps such a patient shows at least a temporary straightening of the eyes. But new problems are later created by persistent eyestrain, someone attempts to give something approaching the full refractive correction, and the new coordination thus called for between convergence and accommodation induces a secondary divergence. The patient and his ophthalmic physician are then plagued with the question whether to endure the miscellaneous discomforts associated with uncorrected refractive error, or those associated with divergence and possible double vision, or those connected with a further round of surgical procedures.

The professional excuse for such an unfortunate beginning may be found in the statement that the patient was unable to wear the full refractive correction. There is altogether too much ignorance of what is involved in the successful wearing of a full correction with glasses.

Courage as well as understanding on the part of the refractionist is necessary. Too many fear the struggle with a not-too-willing patient. The intelligent cooperation of the parents is essential and is not always easy to secure. It should not be forgotten that the patient's most difficult time is likely to be just when the effect of the cycloplegic drug is wearing off, for at that time the accommodative power has been only partly restored and the strain put upon this incomplete power of accommodation is particularly apt to set up spasm which blurs distant vision. The final conclusion as to the practicability of a full correction should not be arrived at until after a prolonged period of constant wearing of the glasses.

A second mistake, far too frequently encountered, is that of supposing that a squinting or amblyopic eye should receive a full or even an excessive correction, while the nonsquinting eye is undercorrected. The result of such action is to perpetuate the very disturbance of cerebral coordination from which it is desired to escape. No matter if the squinting eye has only one tenth of normal vision with correction, the two eyes should be most carefully balanced as to correction of the full amount of their refractive defects; and they should be corrected on the principle of making them emmetropic in optical construction in combination with the correcting lenses, but by no means upon the false principle of giving them both equally poor vision with correction.

A typical case is that of a doctor's boy who came from a distant city on account of persistent convergence of an amblyopic right eye. This eye had been given an approximately accurate correction, plus 2.50 sphere with plus 0.50 cylinder axis 90 degrees. The good eye had been given plus 0.25 sphere plus 0.25 cylinder axis 90 degrees, but required plus 1.75 sphere plus 1.50 cylinder axis 95 degrees. With the balanced new correction the amblyopic eye no longer turned in, except very occasionly under conditions of excessive fatigue.

Another very questionable procedure is overcorrection of the good eye to an extent which reduces its distant vision to that of the amblyopic eye. Again the brain is not given opportunity to coordinate upon the basis of the accommodative effort required. An analogous objection may be offered to the attempt to force development of the amblyopic eye by occlusion of the good eye, for here the possibility of improving the vision of the amblyopic eye is probably less than the risk of breaking up any tendency to coordination, and much greater hope of gradual improvement in the vision of the amblyopic eye is to be found in constant wearing of a proper correction for both eyes.

In listening to the not very cheering histories of some cases one often won-

ders whether the more or less perfunctory fitting with glasses was not merely a brief approach to a desired attitude of the parents toward operation, rather than a genuine attempt to exclude necessity for operation. It is true that an important percentage of cases of convergent strabismus will ultimately require operation; and it is also true that many patients who have been neglected in early years will show persistent strabismus in spite of absolutely accurate refractive correction after they have reached their teens. But proper nonoperative care of the strabismic patient is possible only upon the basis of an intimate acquaintance with the principles of refraction and with the refinements of refractive technique.

W. H. Crisp.

LIGHT FOR OCULAR HEALTH AND EFFICIENCY

When engineers plan a bridge, the amount of stress that will come on each part is carefully calculated. Then every part of the bridge is built strong enough to carry five times as great a load as the bridge will ever have to carry. Finally, when the bridge is finished, it is tested with the maximum load that can be put upon it; if it yields too much—a minute fraction of an inch—it is not approved. Safety first, is a good slogan. But it has been efficiently applied to eyes, and to the amount of light that eyes are expected to work by.

The foot-candle is the old unit for measuring the amount of light. When Lincoln read by the light of a tallow candle, holding the flame one foot away from the page, he had 1 foot-candle of light to read by; but if the flame was two feet away he had only one quarter as much light from it. The amount of light diminishes as the square of the distance. A boy who lays his book on the floor, ten feet from a 100-candle-power electric ceiling light, gets just 1 foot-candle of illumination for his reading. If he puts the book on a table, so that the light strikes the page obliquely at an angle of 45 degrees, the light has only about two thirds the brightness it would have if it fell squarely on the page. If the book is held in the hand, the light may fall on it even more obliquely.

The light that reaches the retina from the object looked at depends on the size of the pupil. The size depends on the amount of light entering from all parts of the field of vision. Through a six-millimeter pupil it is nine times as much as comes through a two-millimeter pupil. Hence the need of strong light on the thing loked at. With a fair light on other things, there is need for a special light to read or work by. Glare, reaching the retina by too much light from other things, reduces the light the eye has to work by. Lighting for eye work is something for careful study and planning; for general lighting of rooms, for each kind of work, and for each patient.

From what is known of "cave dwellers," it seems certain that caves were used by them as refuges from enemies, or from desert heat, or winter cold; and that no race of men has used them as a daytime dwelling place. The species of fish, or other animals that live in caves, have eyes that are degenerated and often blind. Coal miners, working years under ground, are subject to chorioretinal degenerations as well as to nystagmus. Light is necessary for healthy nutrition of the eye, as well as for its use.

In this age of great cities, with immense office buildings, the importance of good lighting should be emphasized as never before. Illuminating engineers must revise upward their standards of proper illumination for indoor work. A better understanding of this subject is needed by those who are treating the diseases, and correcting the defects of the eye. Many of their offices, and most of the cards for testing visual acuity, receive only an insignificant fraction of the 10,000 foot-candles available out of doors, at noon on a clear day. Indeed, most indoor work is done with less than one tenth of 1000 foot-candles available out of doors on a cloudy day. No photographer would expect to get a sufficient exposure for a good picture by the light depended upon in most offices.

That the doctor and the patient find inferior light "comfortable" and "soft" to their dark-adapted eyes, is no sufficient excuse for being satisfied with such poor illumination. The eye has been evolved to use light. Its health depends on light. It can do nothing without light, and cannot do its best without the best light. Nothing else can be prescribed for the eyes that is so important as good light, whether they be defective or perfect eyes.

Eyes are made for light. Through evolution they have been made by light. Living in cities and working indoors, we forget this. Turning light on or off, we forget the hours of slowly growing dawn and slowly fading twilight, for which our vision is adapted. The sudden shock of light to the dark-adapted eyes is unpleasant; and we blame the light for the shock, and not the sudden change for which the eye is unprepared. We are so full of indoor work we forget the good that it does us to get out of doors, on the golf links, the broad plains or mountains, or the bathing beach. The stimulus of strong light has much to do with the sense of well-being that gives value to all outdoor recreations and to life. In the shift from country to town living, the value of light should not be left behind.

Visiting the offices of many ophthalmologists the writer remembers most of them as being very poorly lighted, and scarcely one that was fully lighted. Even the test card, with special apparatus to illuminate it, had nothing like the light that is all about us out of doors, even on a cloudy day. It is very convenient to have a room that can be changed from a dark room to a refraction room, by turning on an electric switch. It is cheap as to office rent, but costly as to the quality of service we can give our patients. Even if we secure a moderate light on the test card we test with a half-dilated pupil, even when no mydriatic has been used. The patient is sent out with glasses chosen with a pupil he will never have when looking at a distant landscape, or reading fine print, or threading a needle, or doing any fine mechanical work. No system of deducting from the strength of the plus lens, or looking obliquely through the lens before his eye, will enable him to see as well through the glasses chosen for his dilated pupil, as he could see through the glasses chosen with the pupil contracted, as it will be when the glass is used.

Because we use eyes with contracted pupils, because the most perfect vision is obtained only through a small pupil, the light we work by must be brought more nearly to the strength of outdoor light. This is particularly important to the worker who is growing older, and must depend on the contraction of the pupil to reduce the blurring of his irregular astigmatism, or any imperfection of his correcting glasses—even the slight variation in the distance of the letters he is reading, as he glances along a line of writing, from one side of the page to the other.

Edward Jackson.

SHORT INTENSIVE SPECIALTY COURSES

Having just completed a week of intensive graduate lectures, one pauses to rest and take stock.

The attendance—forty-three recognized specialists from nineteen states—is sufficient testimony of the demand for this type of course, especially considering that a minimum of advertising was done and that the course had never been given previously. One week was chosen because it was thought that much ground could be covered in that period and yet it would not be long enough to disrupt completely the practice of the registrants.

Successful teaching of this character has been given in different places for a number of years. One of the earliest courses—perhaps the very earliest—and always popular—is that which is given each summer in Denver under the direction of Dr. Edward Jackson.

The age and type of man who enrolls are of interest. All ages from thirty to sixty years were represented in the Washington University course, the average being forty. Eagerness to learn was perhaps the outstanding characteristic, although "endurance" would have

to be commented on secondly, as lectures began at eight-thirty every morning. The luncheon hours were used for talks and "round tables." Two hours were allowed for dinner, while the evenings, until ten o'clock, were devoted to clinics or lectures.

The curriculum presents a real problem; whether to offer what is wanted or what is needed! Most popular are surgical demonstrations. They are difficult to give, are seen adequately by only a half dozen of the group, and are certainly seldom most desirable for the patient. How many eye surgeons would care to have their own cataracts operated on as part of a demonstration for a large group of visiting physicians! The very few who can really be close enough to see clearly all the steps in the operation undoubtedly receive considerable benefit, because the handling of a complicated case by an adept technician is very illuminating. The skillful delivery of a lens that has resisted ordinary methods of removal and become dislocated is most instructive. The perfectly smooth operation can be demonstrated best by motion pictures, but I have yet to see moving pictures of the handling of cases in which serious complications have arisen during the operation. It is difficult to avoid offering some operative demonstrations in these intensive courses because of the demand. One can only hope that something will be learned from them and not too much damage be done!

Nonsurgical clinics are popular and instructive. They are best conducted in small groups so that the patients can be well seen and freely discussed. A correlation of clinical findings with demonstrations of similar pathological material is most instructive. The latter feature, however, cannot be overstressed or the attention will wander.

Lectures should contain much objective material, either lantern projections, apparatus, specimens, or blackboard illustrations. The reading of a long paper without illustrations is very dreary; in general, talks are preferable to papers.

Subjects having an obviously practical and immediate application are especially valuable. Such are "New therapy" and "Helpful hints in simple surgical proceedings." Most ophthalmologists enjoy operative work and, even if they do only a small amount of it, like to discuss this phase of their practice.

Histology, pathology, and optics, though much needed are not much wanted. They are too foreign to the thoughts of most ophthalmologists, who have little background of knowledge in these subjects but no great yearning to increase it.

The planning and the giving of these intensive courses are difficult and wearing, but the sincere appreciation expressed by many of those who participate in them is adequate compensation.

Lawrence T. Post.

PHYSICIANS AND THE OPTICAL RETAIL CODE

Under the above heading the editor of the Journal of the American Medical Association discusses this important subject (J.A.M.A., 1935, March 9, p. 838). The editorial should be read by every ophthalmologist, as it may concern him vitally. A new effort has been made by a trade organization to interfere in the conduct of his practice. This time it is the Optical Retail Trade Code Authority which in a letter addressed "To Oculists and Physicians Dispensing Ophthalmic Products," demands "that the physician to whom it is addressed fill out a questionnaire relative to the nature and extent of the physician's optical business and pay assessments amounting to $3.00 for each employee in his service."

The assessment is for the support of the organization making the demand! This trade organization was formed under the National Industrial Recovery Act.

That it has no power whatever over the physician in his practice of medicine is obvious and a further limitation on its power is clear when one recalls the many recent adverse decisions of the courts with regard to the authority of the N.R.A. when it attempts to control matters which do not pertain to interstate or foreign commerce.

The following excerpt from the J.A.M.A. article is so pertinent that it is quoted in full.

"Under no provision of the act can a physician who confines his work to rendering professional medical services be subjected to any provision of the code or to any assessment under the code. A person who on his own account commercially buys and sells eyeglasses and spectacles and makes a commercial profit on the transaction is presumably within the purview of the Optical Retail Trade Code, even though he happens to be a physician. A physician, however, who buys and sells eyeglasses and spectacles only as the agent of patients for whom he prescribes them and without making any commercial profit on the transaction is not within the terms of that code. The fact that a physician charges for his professional services in prescribing and fitting glasses and spectacles does not alter the situation. The American Medical Association has protested against the attempt of the Optical Retail Trade Code Authority to bring physicians as such within the scope of the code that it administers. Pending the adjustment of those protests, physicians who are engaged in strictly professional work are advised to refrain from answering the questionnaire sent them by the Optical Retail Trade Code Authority and to refrain from paying the attempted assessment for the support of that code authority. The outcome of the protest will be promptly reported in THE JOURNAL."

The editor of the American Journal of Ophthalmology concurs fully in the above. That it is necessary in certain localities for ophthalmologists to dispense glasses is generally conceded, but there is no sound reason why the professional fee should not be kept distinct from the cost of the glasses and the two items be listed separately in the bill to the patient, the cost of the glasses to show no commercial profit to the physician. Those who adhere to this reasonable method can certainly not be convicted of being engaged in trade and so do not fall under trade regulations.

Lawrence T. Post

BOOK NOTICES

Bulletins et Mémoires de la Société Française d'Ophtalmologie, 1934 (47th year), octavo, paper bound, 554 pages. Many illustrations in black and white, one plate in color. Masson et Cie, Paris.

The present volume reports the meeting of May 14-17, 1934. The volume consists of 458 pages in addition to the usual presentation of the statutes and rules of the Society, the roll of members and foreign delegates, and the business reports of the meeting. The names of 42 new members are announced, and short biographies of eleven members who died during the year are included. The deceased are Angelucci, Mlle. d'Autrevaux, Castéran, Chaillous, Collomb, Detrenne, Denis, Lawford, Lebègue, Maddox, and Sacha. The Report for 1935 will be The Intracapsular Extraction of Cataract by de Saint-Martin of Toulouse. The Society selected Radiography in Ophthalmology as the subject for 1936; this will be presented by E. Hartmann of Paris.

The 45 original papers are, in general, of high quality and cover the subjects of physiology, physiological optics, cataract, glaucoma, trachoma, retinal detachment, congenital anomalies, injuries, and unusual cases. The report, "Biomicroscopy of the Conjunctiva" by Cuénod and Nataf is not published in the Bulletin, but appears as the 5th volume of the Atlas de Biomicroscopie Oculaire. Outstanding among the papers are the discussion of the pathogenesis and diagnosis of trachoma by Cornet, studies of the hyaloid membrane after cataract extraction by Poyales and Moreno, the initial stage of detachment of the retina by Gonin, treatment of detachment of the retina by Jeandelize, Baudot, and Gault, the occurrence of arterial spasm in ocular pathology by Bailliart, and a discussion of carotid sympathectomy in certain degenerative lesions of the optic nerve and retina by Magitôt. A review of each paper will appear later.

P. J. Leinfelder

Coincident ophthalmoscopy and histology of the optic nerve. By Gustav Guist, M.D. Published by the author, Vienna, 1934. In two volumes, with 164 figures and 3 plates.

This book consists of two volumes, (1) an atlas containing the illustrations with index of the figures and an alphabetical index of the various subjects referred to, and (2) a text containing complete description of the figures with discussion as to their significance.

The atlas contains 164 figures, seven being photographs, three of which were taken in natural colors. Most of the illustrations are in color. The purpose of the book is a study of the optic nerve through a correlation of the fundus appearance and the pathological specimen. Ophthalmoscopic illustrations are interspersed with figures showing the pathology of the conditions seen in the fundus.

Each figure is protected by a transparent tissue on which are outlined the principal markings in the drawing, and letters indicating features which are described in the text. The figures are remarkable in their clarity and beauty, especially excellent as depicting features described by the author in the text.

The second volume is a 181-page book including a good alphabetical index. The material illustrates almost every condition of the optic nerve. There are nine chapters, the first 68 pages being devoted to the details of the normal disc with the accompanying histological pictures. Congenital anomalies are next considered, then degeneration and atrophies, circulatory disturbances, choked disc, mechanical lesions, and finally tumors. Especially interesting observations are those on the retinal vessels, pseudoneuritis, and glaucoma.

Lawrence T. Post

CORRESPONDENCE

Dosage of Old Tuberculin

Editor, American Journal of Ophthalmology:

A mistake in my Handbook of Ocular Therapeutics has come to my attention and I would very much appreciate it if the following note of correction could be published in your journal.

On page 69, in the table for dosage of old tuberculin, doses No. 33 to 36 are given as .2 to .5 c.c. of concentrated O.T. This would be taken to mean the original pure old tuberculin and would, of course, mean a much larger dose than the one desired. In cases which require doses over 1 mg. a special dilution must be made up, containing 1/10 c.c. of concentrated old tuberculin to 10 c.c. of normal saline. Of this 1/10 c.c. equals 1 mg. of tuberculin and doses 33 to 36 should be .2 c.c., .3 c.c., .4 c.c., and .5 c.c. of this dilution. The other statements as to dosage are correct.

Sanford R. Gifford

ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is only mentioned in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

1. General methods of diagnosis
2. Therapeutics and operations
3. Physiologic optics, refraction, and color vision
4. Ocular movements
5. Conjunctiva
6. Cornea and sclera
7. Uveal tract, sympathetic disease, and aqueous humor
8. Glaucoma and ocular tension
9. Crystalline lens
10. Retina and vitreous
11. Optic nerve and toxic amblyopias
12. Visual tracts and centers
13. Eyeball and orbit
14. Eyelids and lacrimal apparatus
15. Tumors
16. Injuries
17. Systemic diseases and parasites
18. Hygiene, sociology, education, and history
19. Anatomy and embryology

1. GENERAL METHODS OF DIAGNOSIS

Aliquò-Mazzei, A. **Argyll Robertson sign following cranial injury.** Lettura Oft., 1934, v. 11, May, p. 209.

In a female aged forty years, following a cranial injury with a fracture of the left parietal bone, there was found on the right side a typical Argyll Robertson pupil associated with paresis of the facial nerve. By serological and neurological examinations lues and all other affections which might be the cause of the pupillary reflex rigidity were excluded. The author maintains that in this case there occurred indirectly a basal lesion simultaneously affecting the trunk of the facial nerve and the pupillomotor fibers of the common oculomotor nerve. The pathology and theories of the symptom are discussed and numerous cases are cited from the literature. (Bibliography.)

F. M. Crage.

Dekking, H. M. **Infrared photography of the eye. Communication 2. The pigment.** Graefe's Arch., 1934, v. 133, p. 20.

In the first communication it was stated that the ocular pigment is always reflected exceptionally brightly in infrared exposure. In the present paper, this fact is confirmed and demonstrated by several photographs of the iris. If with infrared light of about 8100 A.E. one photographs a bright blue and a very much pigmented iris, the dark brown iris is frequently reproduced definitely brighter than the blue iris. Infrared photography therefore is the best method to present objectively abnormalities of the pupillary margin, synechia, and so on. H. D. Lamb.

Eleonskaia, V. **Modification of the iodin amyloid reaction, and its application to studies of the eye and its adnexa.** Sovietskii Viestnik Opht., 1934, v. 5, pt. 5, p. 481.

The author uses one drop of one percent Congo-red to 10 cm. of water. The microscopic sections are immersed in this solution for ten to twenty min., washed in water, and transferred to Lugol's solution. With this method amyloid tissue takes on a bright green or yellowish-green color, while connective tissue stains red. The combination of Congo-red and Lugol's solution demonstrates amyloid tissue whereas either reagent used alone fails to bring it out. The combined stain is specific for amyloid tissue. Ray K. Daily.

Goldmann, Hans. **A new revolving nosepiece for the slitlamp.** Klin. M. f. Augenh., 1934, v. 93, Oct., p. 522.

This apparatus is illustrated with description pointing out its advantages.

C. Zimmermann.

Gray, W. A. **A note on the fixation of specimens for celloidin sectioning.** Brit. Jour. Ophth., 1935, v. 19, Jan., p. 47.

The author uses alcohol as a fixative, thirty percent solution in distilled water at first, gradually increased by two percent up to absolute alcohol for the first twenty-four hours. A small portion of the corneosclerotic junction is sliced off and the specimen is further treated in absolute alcohol for another twenty-four hours. D. F. Harbridge.

Hassin, G. B., and Thompson, J. J. **Pupillotonia or tonic pupils: report of three cases.** Jour. Nerv. and Mental Dis., 1934, v. 80, Oct., p. 430.

Three cases of tonic pupils are reported. The first showed failure of reaction to artificial light, good reaction to diffuse daylight after sojourn in a dark room, and slow convergence reaction with the pupil remaining contracted for a short time after convergence was relaxed. The second case showed two unusual features—loss of tendon reflexes and a tonic pupil which was narrower than the normal pupil. In the third case the diagnosis of tonic pupil was based on pupillary reaction in diffuse daylight. The tonic pupil is differentiated from the Argyll Robertson pupil and from internal ophthalmoplegia, and the literature is reviewed.
Edna M. Reynolds.

Krol, A., and Pekelnii, H. **A caldron-shaped globe instead of the nitra light.** Sovietskii Viestnik Opht., 1934, v. 4, pt. 6, p. 609.

The authors developed a long caldron-shaped globe to be used in the slit-lamp, as a substitute for the Wolfram spiral of the nitra globe. These globes, manufactured by the Soviet government, are expected to be very cheap in comparison with the Zeiss globes, and therefore readily available.
Ray K. Daily.

Lobeck, Erich. **Measurements in the fundus.** Graefe's Arch., 1934, v. 133, p. 152.

With the help of the Zeiss firm, the author has devised for the Gullstrand ophthalmoscope an ocular on the principle of the heliometer or double-image micrometer used for measuring the diameter of the sun. Divided into two halves by a meridional section in the plane of the optic axis, it is so mounted that the halves can be moved against each other by means of a fine screw, and the amount of motion can be accurately read from a vernier attached to the ocular. In addition, the entire ocular with the halved lens can be turned around its optic axis, so that half the image of the optic disc can be displaced to any part of the image of the visible fundus, so as to compare the diameter of the disc with the size of any other area. H. D. Lamb.

Qurin, A. **Syntropan in ophthalmology.** Zeit. f. Augenh., 1934, v. 84, Nov., 304.

Syntropan in 1.5 percent solution is a mydriatic which is evanescent in effect, does not influence accommodation, and does not injure the corneal epithelium.
F. Herbert Haessler.

Roslavtzev, A. **A time-saving device in the examination of visual acuity.** Sovietskii Viestnik Opht., 1934, v. 5, pt. 6, p. 544.

The author devised a pointer for the test letters, moved by the examiner in any direction by means of a pulley, thus enabling him to direct the patient's attention quickly to any desired letter on the chart. (Illustrations.)
Ray K. Daily.

Schwab, R. **Nonluetic pupillary anomalies in internal diseases.** Deut. med. Woch., 1934, Dec. 21, p. 1966.

From a series of 3,800 medical cases Schwab deduces the following: The Argyll Robertson phenomenon or fixed pupil does not always signify lues. Distorted and unequal pupils are found in diseases of the central and peripheral nervous systems and in other nonluetic conditions. Pupillary rigidity is associated with serious organic disease of the central nervous system.
Theodore M. Shapira.

Zaionchkovski, M. **Adaptometer, etc.** Sovietskii Viestnik Opht., 1934, v. 5, pt. 3, p. 204.

This is a description of an adaptometer of Soviet construction, the results of which check with those obtained by the Nagel instrument.

Ray K. Daily.

2. THERAPEUTICS AND OPERATIONS

Archangelskaja, H. **Operative injuries to Descemet's membrane.** Sovietskii Viestnik Opht., 1934, v. 5, pt. 6, p. 546.

In four cases, one cataract, one iridectomy and cyclodialysis, and two cyclodialysis, postoperative slitlamp studies showed Descemet's membrane lying torn in folds on the posterior corneal surface, or in free shreds in the angle of the anterior chamber. The literature on the subject is very meager, and further clinical as well as histopathologic studies will be necessary to demonstrate the subsequent fate of the torn segments and their effect on vision.

Ray K. Daily.

Benshtein, I. **Levorotatory hyoscyamin and its effect on the human eye.** Sovietskii Viestnik Opht., 1934, v. 5, pt. 5, p. 49.

The research department of the Chemico-Pharmaceutical Institute prepared hyoscyamin sulphate in pure form. A 0.25 percent solution is not toxic, and its mydriatic effect sets in more rapidly than and does not last so long as that of atropin. It does not raise intraocular tension so high as atropin does, and is preferable in cases of iritis with a tendency to increased tension. A 0.5 percent solution does not have such advantages over atropin.

Ray K. Daily.

Busacca, Archimede. **Histidin for the therapy of some painful eye affections.** Klin. M. f. Augenh., 1934, v. 93, Oct., p. 535.

Busacca observed a very marked analgesic effect in iridocyclitis, glaucoma, and corneal ulcers from subcutaneous injections of 2 c.c. of a four percent solution of histidin, an amino acid.

C. Zimmermann.

Golowin, A. **An instrument for double eversion of the lid.** Sovietskii Viestnik Opht., 1934, v. 5, pt. 4, p. 317.

To expose the upper transitional fold the author has devised a lid everter consisting of two rings 5 to 8 mm. apart attached to a handle. The tarsus is held between the rings and, by rotating the handle, the transitional fold is stretched over the posterior ring. (Illustrations.)

Ray K. Daily.

Hernandez, R. L. **My observations on the therapeutic value of ophthalmic diathermy.** Rev. Cubana Oto-Neuro-Oft., 1934, v. 3, July-Oct., p. 89.

The author endorses enthusiastically the use of diathermy in ophthalmology as advocated by Cepero and Comas. Histories of three out of twenty-six serious conditions treated successfully with diathermy are detailed. An iridocyclitis of dental origin cleared up rapidly under diathermy without preliminary attention to the teeth; and a luetic iritis before specific treatment was instituted. A traumatic corneal ulcer with hypopyon healed rapidly without even a nebula.

M. Davidson.

Kapziovskaia, P. **Clinical properties of carotin, used in the treatment of external diseases of the eye.** Sovietskii Viestnik Opht., 1934, v. 5, pt. 3, p. 242.

Seventy-eight patients with various external ocular diseases were treated with local instillations of carotin, in addition to the customary therapeutic procedures. On the basis of this experience the author concludes that carotin has no specific properties, but that used in combination with the usual measures it hastens the healing of superficial inflammatory processes of the eyeball and its adnexa. It acts as an analgesic and relieves the subjective symptoms without any undesirable effect on the corneal epithelium.

Ray K. Daily.

Klauber, E. **Intravenous injections of glucose and sodium thiosulphate in in-**

traocular diseases. Ceskoslovenska Ofthalmologie, 1933, v. 1, no. 4, pp. 204-208.

Ten c.c. intravenous injections of thirty percent glucose either without or with sodium thiosulphate produced no untoward systemic reactions and gave good results in (1) recurrent cloudy vitreous due to tuberculosis, arteriosclerosis, and endarteritis; (2) optic neuritis due to lues. Varying results were obtained in iritis and choroiditis. In cases of cloudy vitreous hypotony was produced by subconjunctival injections of adrenalin. G. D. Theobald.

Lyle, T. K., and Fenton, F. G. **The advantages of intravenous (evipan) anesthesia in ophthalmic surgery.** Brit. Med. Jour., 1934, Sept. 29, p. 589.

Intravenous evipan anesthesia was used in eighty-six cases of ophthalmic surgery. There were no complications and the anesthesia was satisfactory in every case. The duration of anesthesia following a single injection is from fifteen to twenty-five minutes. When more prolonged anesthesia is required, a second injection may be given. The induction is very rapid and the drug is inexpensive. No preliminary medication is required. The contraindications are severe disease of the liver and kidneys. The drug appears safe in respiratory and cardiovascular diseases where inhalation anesthesia may involve considerable risk. Edna M. Reynolds.

Pilman, H., Kolmakova, A., and Nikonov, U. **Aëroionization in the treatment of keratitis and blepharitis in scrofulous and tuberculous patients.** Sovietskii Viestnik Opht., 1934, v. 5, pt. 4, p. 346.

Twenty-eight cases were treated by aëroionization. In a room previously ionized for ten minutes the patients, nude to the waist, were exposed to the electric emanation of a static machine. Beginning with a ten-minute dose, the exposure time was gradually increased, depending on the general and local reactions. With proper selection of cases in relation to local and general conditions, this method of treatment proved a valuable addition to therapeutic measures. Its weakness lies in the empiricism and inexactness of dosage.

Ray K. Daily.

Sprindrich, Jan. **A contribution to the x-ray treatment of various diseases of the eye and its adnexa.** Ceskoslovenska Ofthalmologie, 1933, v. 1, no. 4, pp. 208-212.

The author speaks of the difficulty of application of x-ray therapy to these parts and the necessity for expert knowledge. He reports good results in treating Mikulicz' disease, lymphadenoma, and tuberculosis.

G. D. Theobald.

Urbanek, Joseph. **Progress in tuberculin treatment of eye diseases.** Wiener klin. Woch., 1934, v. 47, Dec. 7, pp. 1490-1494.

Recognition of the fact that not only renewed invasion of the tissues with tubercle bacilli but also a tuberculo-anaphylactic condition may be responsible for the persistence of a chronic uveitis has led to experiments with various tuberculins to eliminate as much as possible the anaphylactic factor. Tuberculo-vaccine A O (Arima) has given the best results, especially in those patients who had had many series of tuberculin injections before.

Bertha Klien Moncreiff.

Weymann, M. F. **Liquid adhesive for eye dressings.** Amer. Jour. Ophth., 1935, v. 18, Jan., p. 21.

3. PHYSIOLOGIC OPTICS, REFRACTION, AND COLOR VISION

Bartley, S. H. **Relation of intensity and duration of brief retinal stimulation by light to the electrical response of the optic cortex of the rabbit.** Amer. Jour. Physiology. 1934, v. 108, May, p. 397.

The author studied the onset of the cortical response to stimulation of the retina with light by varying the intensity and duration of light flashes. Implicit cortical time is defined as the interval between the beginnings of stimulation and response. Intensity and duration of flash were both effective in

changing implicit time. For intensities of 2400 candles per square foot the duration must be as short as four or five sigmas materially to lengthen implicit time. The manner in which these factors change implicit time is comparable to their effect on the reaction times of retinal and optic nerve discharges; so that in this relationship the cortex resembles the eye. M. E. Marcove.

Bogoslovsky, A. J. **The dependence of electric sensibility of the eye upon the different conditions of adaptation.** Graefe's Arch., 1934, v. 133, p. 105.

The electric sensibility of the eye varies according to the intensity and duration of the preceding light stimulus. In the course of dark adaptation electric excitability diminishes continuously, at first rapidly and then more slowly. In persistent light adaptation the electric sensibility at first increases, attains a maximum, and then diminishes. The greater the brightness of the light, the shorter the interval to such a transition of sensibility from increase to decrease. With a certain weak degree of brightness of the light-adapted eye, the electric excitability of the eye remains persistently unchanged.
H. D. Lamb.

Buschke, Wilhelm. **Concerning the effect of the melanophore hormone on dark adaptation of the human eye.** Klin. Woch., 1934, v. 13, Dec. 15, pp. 1785-1786.

The author found that neither instillation into the conjunctival sac nor subconjunctival injections of melanophore hormone influenced dark adaptation.
Bertha Klien Moncreiff.

Engelking, E. **The illuminating value of colored lights in different adaptations of the visual organ. A contribution to heterochromic photometry.** Klin. M. f. Augenh., 1934, v. 93, Nov., p. 577. (Ill.)

For the definition of luminosity Engelking replaces the unreliable estimation of the luminosity of colors from direct impression by the much more exact use of minimal field illumination. He finds the illuminating value of colored lights in good light adaptation to be independent of the character of the color, and to coincide accurately with the minimal field luminosities. In dark adaptation when only the dark apparatus of the retina works, the visual values of the colors correspond to their dark values. In an intermediate state, in which cooperation of both apparatuses must be presupposed, the visual values of the colors do not uniformly coincide with their colorless luminosity and under certain conditions visual values may occur which are directly contrary to Purkinje's phenomenon.
C. Zimmermann.

Ferree, C. E., Rand, G., and Stoll, M. R. **Critical values for the light minimum and for the amount and rapidity of dark adaptation.** Brit. Jour. Ophth., 1934, v. 18, Dec., p. 674.

Values are given for the light minimum in 206 eyes at ages ranging from nine to seventy years, 114 male and 92 female, determinations having been made at the end of a standardized period of light adaptation and after 1, 2, 5, 10, 15, and 20 minutes of dark adaptation. To determine norms for clinical use the observers were divided into two groups, those under and those over thirty-five years of age.
D. F. Harbridge.

Goldmann, Hans. **A luminous fixation point for Javal's ophthalmometer.** Klin. M. f. Augenh., 1934, v. 93, Oct., p. 524. (Ill.)

In measuring corneal astigmatism with the ophthalmometer in aphakics, fixation by the patient is often difficult to secure. Goldmann affixed to the tube a small metallic ball illuminated by a little lamp in a light-tight capsule, and appearing to the patient as a luminous point. This allows easy fixation without throwing any light into the eye of the observer. C. Zimmermann.

Hamilton, W. D. **High myopia in a baby aged nine months.** Trans. Ophth. Soc. United Kingdom, 1933, v. 53, p. 619.

In a family of nine children, the youngest three all had myopia with as-

tigmatism ranging from 13 to 15 D. The first six all had good sight and did not wear glasses. The youngest child was seen at the age of nine months, and his myopia in refraction under atropin was 13 D. The choroid was greatly thinned, the discs were normal. A year later the child was reexamined and the refraction and fundi remained the same although the glasses had not been worn.

Beulah Cushman.

Holth, S. **The phenomenal visual acuities of the European chimney swallow.** Brit. Jour. Ophth., 1934, v. 18, Dec., p. 703.

This swallow (Hirundo rustica) has one nasal fovea for monomacular vision for distance, and two temporal foveae for bimacular vision at short distances. Such a swallow observed at a distance of at least twenty meters a little dry fly with which the author was fishing. When the swallow got within one meter it stopped abruptly: perhaps observing the little hook with the temporal foveas.

D. F. Harbridge.

Malinowski, T. **New charts for accurate testing of visual acuity.** Klinika Oczna, 1934, v. 12, pt. 3, p. 466.

The test objects are similar to Landolt's rings and are based on the same principle. They consist, in each line, of four round black discs, with eight white openings.

Ray K. Daily.

Much, Victor. **The question of contact glasses, reply to Dr. J. Dallos.** Klin. M. f. Augenh., 1934, v. 93, Oct., p. 514.

Much's experiences with about five hundred contact glass patients observed for months and years are much better than those of Dallos (See Amer. Jour. Ophth., 1934, v. 17, p. 368).

C. Zimmermann.

Nordenson, J. W. **The mechanism of accommodation.** Klin. M. f. Augenh., 1934, v. 93, Nov., p. 591.

Nordenson discusses in detail the arguments of Pflugk against the accommodation theory of Helmholtz and in favor of his own. The new facts offered by Pflugk are, according to Nordenson, inadequate for discarding Helmholtz's theory.

C. Zimmermann.

Paul, Ludwig, **A simple method for measuring the position of the ocular axis in near vision.** Klin. M. f. Augenh., 1934, v. 93, Oct., p. 528. (Ill.)

Exact measurement of the position of the visual lines in near vision is often desirable in asthenopia. Paul describes a small apparatus which does not require questioning of the patient.

C. Zimmermann.

Peters, A. Zeit. f. Augenh. **Hyperextensibility ("Dehnsucht") of the eyeball.** 1934, v. 85, Dec., p. 1.

Grunert recently published a book under the title "Dehnsucht des Auges." Peters points out that Grunert is not justified in concluding that merely because the use of pilocarpin relieves many myopics from ocular pain the cause of the pain is stretching of the sclera.

F. Herbert Haessler.

Plummer, F. C. **Case of homatropin poisoning.** Trans. Ophth. Soc. United Kingdom, 1933, v. 53, p. 625.

Two drops of two percent homatropin were instilled for refraction in a woman thirty years of age, and twenty minutes later two more were instilled, and she immediately became faint and wildly delirious. This condition lasted until after five hours she regained consciousness for five minutes. She then apparently slept peacefully all night, and for the next two days was only awakened with difficulty for meals. On the fourth day reading was very blurred, and she complained of a severe headache. On the fifth day she was able to get up, but was very weak. She had no idiosyncrasy to belladonna by mouth, but a severe idiosyncrasy to quinine.

Beulah Cushman.

Samoilov, A. **Clinical studies in color blindness.** Sovietskii Viestnik Opht., 1934, v. 5, pt. 3, p. 192.

This is a comparison between the German and Soviet editions of the Stilling color charts. The Soviet edition was

inferior in coloring and paper, but sufficiently accurate for use in vocational selection. Ray K. Daily.

Schmidt, Ingeborg. **On manifest heterozygosis in female bearers of disorders of color sense.** Klin. M. f. Augenh., 1934, v. 92, April, p. 456.

The genealogic tree of a color-blind woman with one protanopic and three normal sons is given. It was assumed that red-green insufficiency became manifest in spite of a probable heterozygous tendency. It is shown that with the usual tests (Ishihara's plates and the anomaloscope) female bearers for disorders of color sense cannot be separated from the normal, or the single types of female bearer from one another. Deuteranomalous female bearers are frequently uncertain in reading Ishihara's plates and show a quotient higher than unity. The maximum luminosity of bearers of the D group lies in the region of sodium yellow, that of the P group at from 570 to 575 micromillimeters. This proves a genotypic difference between P and D groups and hence also in the heterozygous condition. C. Zimmermann.

Semenovskaja, E. N. **Further observations on increase of sensitiveness to light in dim light through a preceding light stimulus.** Graefe's Arch., 1934, v. 133, p. 115.

After ten minutes stimulation of both eyes by red light, the subsequent sensibility shows a significantly greater increase than after binocular stimulation by white light of the same brightness. Thus in the first fifteen minutes of the dark adaptation the sensibility to light after stimulation by red light is higher than normal, but after stimulation with white light it is lower than normal. This fact that red light, which acts only upon the cones, increases the light sensibility of the rods, shows that there is a reciprocal action between the central controls of the two apparatuses.
H. D. Lamb.

Sewall, Henry. **Induced ocular luminescence as a probable source of entoptic vision.** Amer. Jour. Physiology, 1934, v. 108, May, p. 409.

The author discusses some entoptic phenomena which apparently have not been described before. When, while reading at night, the external light is suddenly turned off, after images appear as shadows which may last from twenty to forty seconds and which may be projected on a chart. The author believes that these figures represent the shadows cast by the blood vessels on a retina faintly illuminated by a phosphorescent lens. M. E. Marcove.

Stocker, Franz. **The relation between refraction and brain development.** Graefe's Arch., 1934, v. 133, p. 131.

Study of 124 children (55 boys and 69 girls) who were weakly endowed but not idiots showed that diminished development of the eyeball was paralleled by diminished development of the brain. The first appeared in greater degrees of hypermetropia, the latter in diminished circumference of the skull and lower intelligence. H. D. Lamb.

Trendelenburg, Wilhelm. **A signal-light apparatus for testing color-blindness.** Klin. M. f. Augenh., 1934, v. 93, Oct., p. 433. (Ill.)

Trendelenburg describes an apparatus for examination for color-blindness and anomalies of color sense in close relation to practical conditions. The colors can be independently changed according to luminosity and saturation. C. Zimmermann.

Zaionchkovsky, M., Sklarevich, V., and Rebone, K. **Examination of depth perception and stereoscopic vision.** Sovietskii Viestnik Opht., 1934, v. 5, pt. 6, p. 509.

This describes an instrument developed by the Military Electro-technical Academy, and evaluates the devices used for study of depth perception and stereoscopic vision, upon the basis of tabulated findings on 850 students at the Academy, tested with each device. (Illustrations.) Ray K. Daily.

4. OCULAR MOVEMENTS

Adams, W. S. **An inquiry into the condition of the ears in miner's nystagmus.** Trans. Ophth. Soc. United Kingdom, 1933, v. 53, p. 577.

The author used the caloric and galvanic vestibular tests in connection with the findings as to the eustachian tubes. He decides that closure of the eustachian tubes is not the cause of miner's nystagmus.

Beulah Cushman.

Alabaster, E. B. **An inquiry into the condition of the ears in miner's nystagmus.** Trans. Ophth. Soc. United Kingdom, 1933, v. 53, pp. 571-586.

The author summarizes as follows the sequence of events in most of the miners examined with nystagmus: presence of catarrhal condition of the nose, extension of infection along the eustachian tube, congestion of the middle ear, confusion arising from antagonism between the two labyrinths, an attempt to obtain cerebral adaptation by means of vision, frustration of this attempt by defective illumination, fatigue of the elevators of the eyes.

Beulah Cushman.

Aliquò-Mazzei, A. **Congenital paralysis of associated lateral movements of the eyes.** Lettura Oft., 1934, v. 11, Sept., p. 419.

Many references are made to the literature of the subject. In a male aged twenty-six years there was a conjugate deviation toward the right side, associated with horizontal nystagmus directed from right to left and a compensatory deviation of the head toward the left. Associated movements toward the left were practically abolished, and upward movements markedly limited, the lower ones less so. Convergence was practically normal. There was no consanguinity in the parents. A brother of the patient has conjugate deviation toward the left. The author concludes that there is on each side a coordinating supranuclear center for associated lateral movements, located in the pons probably near and above the abducens nucleus. (Bibliography.)

F. M. Crage.

Alvaro, M. E. **Squint measurement with Priestley Smith's improved method.** Amer. Jour. Ophth., 1935, v. 18, Feb., pp. 143-145.

Bartels, M. **Concerning miner's nystagmus.** Med. Klin., 1934, v. 30, Dec. 7, pp. 1632-1634.

Miner's nystagmus is the most typical occupational disease, characterized by a fast rotary motion which remains the same in all positions of the eyeball, but is eliminated during convergence. Only in very rare instances of chronic veronal poisoning and in postencephalitic conditions has similar nystagmus been observed. Poor illumination, coal dust, and gas poisoning have been discussed as the eliciting factors. The cerebral centers have to be looked for somewhere between the medulla oblongata and the mesencephalon.

Bertha Klien Moncreiff.

Cunningham, E. R. **Oculogyric crises.** Chinese Med. Jour., 1934, v. 48, Sept., pp. 1006-1008.

A Chinese woman of twenty-two years had had oculogyric crises since a severe illness resulting in unconsciousness ten years before. There was some incoordination of the muscles of the left arm and leg, with exaggerated tendon reflexes on both sides. The ocular condition consisted of spasms with conjugate movement of the eyes to the right and upward and compensatory movement of the head to the left. A diagnosis of postencephalitic oculogyric crises was made.

John C. Long.

Filippi-Gabardi, E. **Paralysis of associated vertical movements of the eyeballs.** Riv. Oto-Neuro-Oft., 1934, v. 11, Sept.-Oct., pp. 463-482.

A man thirty-six years of age, affected by cerebral endarteritis and positive Wassermann, showed abolition of associated movements upward, partial abolition of associated movements downward, and paralysis of direct upward and downward convergence. A man of forty-nine years affected by left hemiparesis following an apoplectic stroke showed paralysis of associated

movements upward and abolition of convergence upward. Both patients, on attempting to close their eyes while the examiner kept their lids forcibly open, showed movements of binocular convergence. From these symptoms the author deduces the presence of mesencephalic coordinating oculomotor centers for vertical movements and probable special centers for the various movements of convergence, situated along the tracts of origin of the third nerves. (Bibliography and two tables.)
M. Lombardo.

Glauberman, S. **Paralysis of the sixth nerve of auricular etiology.** Sovietskii Viestnik Opht., 1934, v. 5, pt. 4, p. 311.

Of three cases of Gradenigo's syndrome, one occurred in the course of a chronic and two in acute mastoiditis. The author attributes the involvement of the sixth nerve to inflammatory processes at the apex of the pyramid of the temporal bone. Ray K. Daily.

Grimm, R. **Phenomena and measurements in convergence and fusion.** Graefe's Arch., 1934, v. 133, p. 121.

The author discusses the relations of biologic space to physiologico-optical phenomena. The latter belong to the "tapetum-images." The principal part of the experiment for the position of composite images is exclusion of the decisive influence of convergence. When all other localizing factors are eliminated, convergence and not accommodation, as far as it generally acts (about up to a distance of 8 or 10 m.), determines the position of the fixation point in space. H. D. Lamb.

Mayou, Sheila. **The results of orthoptic treatment in divergent strabismus.** Brit. Jour. Ophth., 1935, v. 19, Jan., p. 37.

Of ninety-three cases, forty-eight are stated to have been emmetropic, twenty-six hyperopic, and seventeen myopic. Many had squinted since birth, some at from one to three years of age. Certain hyperopes squinted at between ten and twenty-nine years; and of the myopes one as late as thirty-five years. Many illustrative case histories are given. Cases of divergent strabismus benefit from orthoptic treatment whether they can be cured by treatment alone or require operation. The majority are cured by orthoptic treatment alone without operation. In the percentage of emmetropic cases the majority have periodic or occasional divergent strabismus. Very few divergent squints are associated with amblyopia.
D. F. Harbridge.

Oesterberg, G. **Unilateral nystagmus and spasmus nutans.** Det oftalmologiske Selskab i Köbenhavn's Forhandlinger, 1933, pp. 28-30, In Hospitalstidende, 1934, Nov. 20.

The patients were thirteen, eight and six months old respectively. The first had unilateral nystagmus only; the second a vertical nodding of the head and later a bilateral nystagmus; the third a unilateral nystagmus and a vertical nodding of the head. The literature is reviewed. The conclusion is reached that these cases can be classified as to severity on a scale in which the full symptom complex (nodding spasm, abnormal position of the head, and bilateral nystagmus) is at one end and mere unilateral nystagmus at the other. Complete recovery is the rule. As to the cause very little is known. An explanation for the occurrence of the disorder in children of this age may lie in incomplete myelinization of certain nerve tracts at a time when reflex movements of the head and eyes are developing.
D. L. Tilderquist.

Pallestrini, E. **Inhibition of pathologic spontaneous nystagmus as an element of prognosis in the surgical treatment of endocranial neoplasms.** Riv. Oto-Neuro-Oft., 1934, v. 11, Sept.-Oct., pp. 545-562.

Tumors at the right and at the left cerebellopontine angle and a neurofibroma of the acoustic nerve all showed horizontal spontaneous nystagmus that could be inhibited by the rotatory and thermic tests. The cases were successfully operated on. The positive control test gives a good prognosis, for its absence shows a lesion of the conductive

system and thus severe intrinsic or extrinsic endocranial lesion. (Five tables.) M. Lombardo.

Soloviev, L. **Sutures in operations for strabismus.** Sovietskii Viestnik Opht., 1934, v. 5, pt. 3, p. 214.

The author does the Schweigger resection, with the modification that the middle needles, after being brought out through the conjunctiva at the limbus, are passed vertically downward and upward through the lateral edge of the conjunctival wound and then tied. This closes the conjunctival wound, places the knots of catgut away from the conjunctiva, and serves to hold the tendon in its new position. Ray K. Daily.

Szymanski, J. **A contribution to the surgery of strabismus.** Klinika Oczna, 1934, v. 12, pt. 3, p. 522.

The author describes a simplified and cheaper myocampter to be used in place of Barraquer's instrument. (Illustration.) Ray K. Daily.

Wilezek, M. **Optokinetic nystagmus and its significance in intracranial localization.** Klinika Oczna, 1934, v. 21, pt. 3, p. 451.

The author reviews the literature on the physiology and the intracranial pathways of optokinetic nystagmus, and on the importance of the patients' attention and of the direction of the revolving drum on the amplitude and frequency of the nystagmus. The author's own studies show that in cases with very narrow visual fields nystagmus to the left may be elicited and yet nystagmus to the right be absent or diminished. The author found normal nystagmus in both directions in many cases of tabetic atrophy, retrobulbar neuritis, tumors of the hypophysis and optic tract, one case of cerebellar tumor, a case of cysticercus in the fourth ventricle, and nine cases of homonymous hemianopsia. Ray K. Daily.

Zaidshnur, I., and Fonhaus, M. **Examination of the ocular muscle balance.** Sovietskii Viestnik Opht., 1934, v. 5, pt. 6, p. 549.

The Maddox phorometer and Bielschowsky's universal prism apparatus were compared on the basis of repeated tests given two engravers before and after their work. The findings on the Bielschowsky apparatus were more accurate, qualitatively as well as quantitatively. Ray K. Daily.

5. CONJUNCTIVA

Bologova, T. **Cytology of the follicle in follicular conjunctivitis.** Sovietskii Viestnik Opht., 1934, v. 5, pt. 4, p. 309.

In nineteen out of twenty-five cases the subsequent course of the disease established the diagnosis of folliculosis clinically. The contents of the follicle crushed between the teeth of a forceps, were spread on a slide and stained with Giemsa stain. Of the nineteen cases, fourteen presented microscopically almost exclusively the picture of small lymphocytes, with here and there a large cell. In five the picture resembled trachoma, each field containing among the small lymphocytes two to six larger cells, and now and then a large lymphocyte. Six cases were cytologically suggestive of trachoma, with many large cells in each field. Of these the clinical course in two cases confirmed the diagnosis of trachoma and four cases could not be followed. While cytologic studies are helpful there are cases in which the diagnosis can be established only by the clinical course. Ray K. Daily.

Borries, G. V. T. **Persistent conjunctivitis cured by endonasal treatment.** Danske neurologiske Selskabs Forhandlinger, 1933-1934, pp. 71-74. In Hospitalstidende, 1934, Dec. 4.

A woman of twenty-six years suffered for four months from a phlyctenular conjunctivitis with keratitis, sometimes affecting the right eye and sometimes the left. No treatment seemed to have any effect. The nasal sinuses proved normal, but shrinkage of the nose caused a definite temporary improvement. Finally the left inferior turbinate was removed and overnight the inflammation of the eyes disappeared. After eighteen months it had not returned. The rapid improvement

was thought to be due to relief of congestion rather than to removal of infection. D. L. Tilderquist.

Busacca, Archimede. **On the structure of Herbert's pits.** Brit. Jour. Ophth., 1935, v. 19, Jan., p. 26.

This investigator has been able to determine in serial sections the exact seat of the tissue corresponding to the pit. He tattooed the pit with Chinese ink some time before removing the part for microscopical examination. The formation consists histologically of thickenings of the corneal epithelium at points where the nodules of trachoma had previously appeared. (Four photomicrographs.) D. F. Harbridge.

Charlin, C. **Hidden trachoma.** Arch. de Oft. Hisp. Amer., 1934, v. 34, Nov., pp. 584-594.

The author has found it difficult to diagnose some cases of trachoma disguised by other conditions such as corneal ulcer, conjunctivitis, blepharitis, etc. But in these cases careful study of the eye with the slitlamp will detect trachomatous pannus and granulation. The condition can be successfully treated with copper salts. Ten cases are reported. (Four illustrations.) Ramon Castroviejo.

Duchan, G. **Conservative treatment of pterygium.** Sovietskii Viestnik Opht., 1934, v. 5, pt. 5, p. 502.

In a case which was operated on four times within a year with rapid recurrence, the author used weekly circular cauterization with copper sulphate, parallel to the limbus. After several applications the pterygium began to pale, and the blood vessels shrank and disappeared. There was no recurrence in the two years during which the patient was kept under observation.

Ray K. Daily.

Dulewiczowa, M. **Cavernous hemangioma of the conjunctiva.** Klinika Oczna, 1934, v. 12, pt. 3, p. 516.

A man twenty-one years of age had a large cavernous angioma which involved the conjunctiva of the lower lid and the lower bulbar conjunctiva, and extended on the globe along the external rectus. The growth was removed under local anesthesia, and the defect corrected by a subsequent plastic operation. (Illustration.) Ray K. Daily.

François, J. **Catarrhal diphtheritic conjunctivitis.** Brit. Jour. Ophth., 1935, v. 19, Jan., p. 1.

With clinical observations in five cases, diagnosis, complications, etiology, prognosis, and treatment are discussed. The essayist concludes that beside the pseudomembranous forms there is a merely catarrhal form, often met with in new-born children and to be ranked among the ophthalmias neonatorum. It shows no pathognomonic sign and seems to be the most benign form of diphtheric conjunctivitis; but it may be complicated with serious corneal lesions. Refractory to ordinary treatment, it heals rapidly under antidiphtheric serotherapy.

D. F. Harbridge.

Golowin, A. **Folliculosis in childhood.** Sovietskii Viestnik Opht., 1934, v. 5, pt. 4, p. 314.

In all, 5,370 children from infancy to seventeen years were examined. The tabulated and graphic report shows that in early childhood the conjunctiva is free from follicles. The curve rises sharply at the beginning of the school age. The appearance of follicles in large numbers at this time is attributed to external irritants and increased demands on the eye. The curve falls somewhat and then gradually rises to the fifteenth and sixteenth year, when it falls again. Rhinological examination showed a parallelism between increased conjunctival folliculosis and hypertrophy of lymphoid tissue in the nose and throat. Ray K. Daily.

Julianelle, L. A., and Harrison, R. W. **Studies on the infectivity of trachoma. 3. On the filterability of the infectious agent of trachoma.** Amer. Jour. Ophth., 1935, v. 18, Feb., pp. 133-139.

Kaminskaja, Z. **An operation for pterygium.** Sovietskii Viestnik Opht., 1934, v. 5, pt. 5, p. 500.

The author recommends a new procedure for recurrent pterygium. A flap of healthy conjunctiva 6 mm. wide is cut above and below the pterygium. The pterygium is thoroughly separated from its bed, and the two flaps of healthy conjunctiva are sutured together. The pterygium is then sutured to the united flaps. The merits of the procedure lie in having healthy conjunctiva next to the cornea, and in avoiding the shortening of the conjunctiva which occurs in excision. (Illustrations.) Ray K. Daily.

Kolmakova, A., and Glauberman, S. **Changes in Waldeyer's ring in trachoma patients.** Sovietskii Viestnik Opht., 1934, v. 5, pt. 4, p. 326.

Study of 100 trachoma patients and of 103 control patients with affections of the upper respiratory tract showed that there was no relation between trachoma and lesions of Waldeyer's ring. The author feels that Angelucci's belief in a constitutional predisposition to trachoma was based on erroneous arguments. Ray K. Daily.

Müller, A. R. **Concerning the treatment of trachoma.** Rev. Cubana Oto-Neuro-Oft., 1934, v. 3, March-June, p. 48.

Both expression and grattage are considered harsh and ineffective measures. They only add more scarring to that inherent in the trachomatous process. The copper sulphate stick is gentler and more effective if properly used. It should be employed after the acute inflammatory reaction has been relieved by hot applications, at first lightly, and not oftener than once a week. In the intervals drops of two percent each of copper sulphate and novocaine in glycerine are used. The results are excellent. M. Davidson.

Neuman, J. **Treatment of trachoma with applications of colloidal iodin.** Klinika Oczna, 1934, v. 12, pt. 3, p. 576. (See Section 6, Cornea and sclera.)

Olontzeva, M., and Pokrovsky, A. **Comparative anatomy of the human and animal conjunctiva.** Sovietskii Viestnik Opht., 1934, v. 5, pt. 4, p. 340.

The author gives photomicrographs and descriptions of the conjunctiva of the new-born and adult rabbit, cat, dog, sheep, pig, cow, and human being. The structure of the conjunctiva of the new-born differs from that of the adult. Variability is one of the characteristics of conjunctival structure and the changes in conjunctival structure and the time of their occurrence depend on constitutional factors and external environmental influences.

Ray K. Daily.

Rostshin, V. **Trachomatous involvement of Denig's transplant.** Sovietskii Viestnik Opht., 1934, v. 5, pt. 6, p. 527.

On the basis of eleven cases of trachomatous involvement of transplanted mucous membrane of the lip the author concludes that this involvement is likely to occur if the transplantation is done before the conjunctival trachomatous process has run its course. Trachomatous involvement of the transplant has no relation to its thickness. Excision of the diseased conjunctiva of the tarsus and fornix does not prevent trachomatous involvement of the transplant. (Photomicrographs.) Ray K. Daily.

Schmidt, Rolf. **Lattice fibers in the conjunctiva.** Zeit. f. Augenh., 1934, v. 85, Dec., p. 24.

Lattice fibers were found in pieces of conjunctiva taken from each of five patients who had respectively a normal eye, vernal conjunctivitis, keratoconjunctivitis, catarrhal conjunctivitis, parenchymatous keratitis, and a tuberculous episcleritic granuloma. These fibers have been demonstrated in the connective tissue of all parts of the body. Their number increases in inflammation and decreases in scar tissue, and their presence is not specific for a definite etiology of inflammation.

F. Herbert Haessler.

Valière-Vialeix. **Granulomas of the bulbar conjunctiva with adenopathy.** Ann. d'Ocul., 1934, v. 171, Oct., pp. 808-813.

Two children aged nine and twelve years presented nodular elevations of the conjunctiva near the limbus associ-

ated with signs of generalized acute conjunctivitis. There were also granulations and follicles in the inferior cul-de-sac, and massive swelling of the preauricular and submaxillary glands on the same side as the ocular lesions. Microscopically the excised nodules resembled nonspecific granulomas. No etiologic agent was discovered.

John C. Long.

6. CORNEA AND SCLERA

Arkin, W. **Pathogenesis of megalocornea.** Klinika Oczna, 1934, v. 12, pt. 3. p. 519.

The author reports a case of right megalocornea in a boy of fourteen years who also had a very large red nevus extending to the midline on that side of the face. The frequent association of juvenile glaucoma with nevus leads the author to believe that megalocornea and juvenile glaucoma may have a common origin in a developmental anomaly.

Ray K. Daily.

Chojnacki, P. **A case of corneal fistula closed by membrane of a chicken's egg.** Klinika Oczna, 1934, v. 12, pt. 3, p. 502.

Coover in 1899 was the first to use egg membrane in treatment of corneal fistula. Simple in technique and effective in results, the method fell into unjustifiable oblivion. The author reports the case of a seven-year-old girl with a fistula of the left cornea of unknown etiology. It was treated without results with scopolamin and noviform salve for five days. Then the fistula was covered with the membrane of a raw egg, and a binocular bandage applied. Two days later the anterior chamber was reformed, but next day it was again empty. The membrane of a cooked egg was then applied and left for three days. On its removal the anterior chamber was found restored and the eyeball was pale. Two more applications of the membrane were made. The fistula healed leaving a smooth grayish scar.

Ray K. Daily.

Danilevsky, I. **Treatment of purulent corneal ulcers with chloramin.** Sovietski Viestnik Ophth., 1934, v. 5, pt. 5. p. 434.

The ulcer is irrigated for one minute with a one percent solution of chloramin (P-tolyolsulphochlorimide), its base touched with a five percent solution, and the eye bandaged with a one percent ointment. In an infected ulcer and an infected postoperative wound, chloramin promptly arrested the advance of the infection and stimulated regenerative processes. Ray K. Daily.

Esteban, M. **On corneal tattooing.** Rev. Cubana Oto-Neuro-Oft., 1934, v. 3, March-June, p. 65.

Keratitis appeared three years after a brilliantly successful tattooing of the cornea with gold chloride. The eye had to be enucleated and sections showed epithelial desquamation, lamellar dissociation, leucocytic infiltration, and vascularization. Descemet's membrane was intact. It is suggested that this method of corneal tattooing is not without danger to the eye. M. Davidson.

Filatoff, V. P. **The technique of partial penetrating keratoplasty.** Arch. de Oft. Hisp.-Amer., 1934, v. 34, Sept., pp. 457-475.

The author has performed partial penetrating keratoplasty ninety-six times by his original technique (modification of Hippel's). Forty-eight of these operations were performed on eyes with complications such as glaucoma, buphthalmos, and ectatic leucoma. Of the other forty-eight eyes operated upon, fourteen kept a permanent transparency of the transplant. The best results were obtained when the transplant was surrounded by healthy cornea. Some details of the technique are described, intended to eliminate the danger of injuring the lens and to prevent the loss of vitreous in aphakic eyes. (Eight illustrations, twenty-seven bibliographic references).

Ramon Castroviejo.

Kalashnikov, V. **In defense of eserin in the treatment of corneal ulcers.** Sovietskii Viestnik Opht., 1934, v. 5, pt. 5, p. 441.

Fifty years ago Donberg urged the use of eserin instead of atropin in cor-

neal affections. For thirty years the author has used eserin, and he proves his contention that miotics are preferable to mydriatics by numerous case histories of corneal disease in which substitution of eserin in weak solution for atropin changed favorably the course of the disease. Atropin, by dilating the pupil, raises the tension of the eyeball, and increases pain by squeezing the blood out of the iris and forcing it into the ciliary body. Ray K. Daily.

Klarfeld, A. **Treatment of severe trachomatous complications.** Sovietskii Viestnik Ophth., 1934, v. 5, pt. 6, p. 578.

While a student under Hirschman, the author learned that old chronic pannus often responds to calcium iodide administered internally in increasing doses and mercury ointments applied locally, combined with symptomatic treatment. Ray K. Daily.

Krilov, T., and Levin, I. **Treatment of ulcus serpens.** Sovietskii Viestnik Opht., 1934, v. 5, pt. 5, p. 430.

Eight cases were treated with methyl salicylate as advocated by Sabatski at the International Congress in Amsterdam. The treatment if used early checks the progress of the ulcer and stimulates healing. Used late and in extensive cases it is ineffective. Ulcers so treated heal with a scar. Ray K. Daily.

Neuman, J. **Treatment of trachoma with applications of colloidal iodin.** Klinika Oczna, 1934, v. 12, pt. 3, p. 576.

On the basis of 300 cases the author concludes that iodin acts favorably on pannus, causing rapid disappearance of ulcers and infiltrations, thinning of the pannus, and improvement in vision. That this action is not due to the alcohol of the tincture of iodin was proved by six cases treated with alcohol alone without result. Iodin sticks, consisting of a water soluble colloidal iodin, are recommended as preferable to tincture of iodin because their application is painless. Ray K. Daily.

Rodigina, A. **Etiology of ulcus rodens corneae.** Sovietskii Viestnik. Opht., 1934, v. 5, pt. 5, p. 422.

A microorganism was isolated which resembled the Zur Nedden bacillus, but differed from it in having no effect on milk, in forming gas instead of acid on sugar-agar, in being very resistant to dryness, and in having an odor in culture. Introduced into the conjunctiva of a rabbit this microorganism produced an ulcer resembling clinically and histologically ulcus rodens. Ray K. Daily.

Rumantzeva, A. **Treatment of serpiginous ulcer.** Sovietskii Viestnik Opht., 1934, v. 5, pt. 5, p. 406.

On the basis of forty-two cases of serpiginous ulcer the author concludes that patients with serpiginous ulcer should have constitutional treatment, that surgical measures should be instituted early if conservative treatment fails, that miotics are indicated and atropin should be used with caution, and that the thermic or galvanic cauterization which leads to a dense scar is undesirable in the pupillary area. Of surgical procedures paracentesis is the simplest, but trephining may be indicated. Roentgenotherapy is of value in very severe cases. Ray K. Daily.

Schewtschuk, J. N. **Treatment of serpent ulcer by corneal trephining.** Zeit. f. Augenh., 1934, v. 84, Nov., p. 307.

The author recommends trephining of the cornea in serpent ulcer as soon as the diagnosis can be made unequivocally. It usually arrests the process. The greater and more protracted the hypotony that follows the treatment, the more satisfactory is corneal regeneration. Anterior synechiae can be avoided if one selects the corneal area which overlies the pupil. The scars are less dense than after seemingly less radical treatment. Trephining must be done early. F. Herbert Haessler.

Shimchovich, I. **A comparison of the Goldfeder and Denig operations for pannus.** Sovietskii Viestnik Opht., 1934, v. 5, pt. 3, p. 196.

The results of 101 operations are tabulated, 24 according to Denig and 77 according to Goldfeder. The conclusions are that Denig's as well as Goldfeder's

operation may have a favorable effect on the course of pannus; that treatment should be continued after the operation; and that both operations are more effective in the end stages of trachoma. A permanent effect was obtained in forty-two percent of cases operated upon according to Denig and seventy-seven percent according to Goldfeder. Goldfeder's operation is more effective because the transplanted cartilage projects higher than the transplanted mucous membrane of the lip and therefore protects the cornea better, and because, as shown by histologic sections, the cartilage forms a more effective barrier to spread of the disease. This operation is technically simpler, cosmetically better, and less inconvenient. (Photomicrographs.)
Ray K. Daily.

Strachov, B. **Transplantation of the cornea.** Sovietskii Viestnik Opht., 1934, v. 5, pt. 5, p. 454.

Out of fifteen cases, four transplants remained transparent, five semitransparent, and six became opaque.
Kay K. Daily.

Varshavskii, I. **Trepanation after Zonderman in the treatment of serpiginous ulcer.** Sovietskii Viestnik Opht., 1934, v. 5, pt. 5, p. 428.

Thirty-nine cases of very severe serpiginous ulcer were treated by trephining. This accelerated healing and relieved the subjective symptoms, although the visual results were poor.
Ray K. Daily.

Wittels, L. **Parinaud's conjunctivitis and tuberculosis of the conjunctiva.** Klinika Oczna, 1934, v. 12, pt. 3, p. 486.

A review of the literature shows that the etiology of Parinaud's conjunctivitis varies. In a five-year-old boy with right granular conjunctivitis and purulent inflammation of the preauricular and submaxillary glands, biopsy demonstrated typical tubercle bacilli, which animal inoculation showed to be of the human type. The conjunctivitis was cured after four treatments with the Finsen light. The second case had nodules in the left upper transitional fold and induration of the left preauricular and submaxillary glands. Histologic and bacteriologic examinations were negative. Ray K. Daily.

Zacharov, A. **Autohemotherapy in trachomatous pannus and ulcers of the cornea.** Sovietskii Viestnik Opht., 1934, v. 5, pt. 5, p. 437.

Every two to five days 0.5 to 1 c.c. of the patient's blood is injected subconjunctivally. The treatment was applied to nine corneal ulcers of nontrachomatous origin, and to fifty-two cases of trachomatous pannus and ulcers. The observations lead to the conclusion that this procedure is a very valuable addition to the usual measures. The pain and photophobia subside, corneal infiltration disappears, and the ulcer heals with a delicate scar. Alone, autohemotherapy is not effective. It has no influence on xerosis and old corneal opacities.
Ray K. Daily.

7. UVEAL TRACT, SYMPATHETIC DISEASE, AND AQUEOUS HUMOR

Berberov, P. **Syphilis and the eye.** Sovietskii Viestnik Opht., 1934, v. 5, pt. 6, p. 565.

A report of eight cases of syphiloma of the ciliary body, with blindness as the final outcome in five. Ray K. Daily.

Burian, H. **Rosary-like pigment stripes in the eyeground.** Zeit. f. Augenh., 1934, v. 84, Nov., p. 293.

On more or less sclerosed choroidal vessels one sees definitely beaded pigment stripes. They begin some distance from the disc and are seen only in patients with kidney lesions and arterial hypertension. The author believes that the lesion is definitely associated with the choroidal lesion, and that the frequently associated kidney lesion is not essential. F. Herbert Haessler.

Cepero, G., and Comas, C. **Diathermy in the iritides.** Rev. Cubana Oto-Neuro-Oft., 1934, v. 3, Jan.-Feb., p. 10, and March-June, p. 50.

On the basis of fifty-nine cases of iritis (luetic, and of prostatic, dental, or

undetermined focal origin), traumatic and postoperative, whose histories are detailed, the authors arrive at the following conclusions: In addition to treatment of the cause, diathermy is indicated as the therapeutic method of attack in all cases of iritis, the only contraindication being the presence of hemorrhage. As an absorbent it is superior to the iodides. M. Davidson.

Ehlers, Holger. **Concerning the vegetative zones of the face.** Danske neurologiske Selskabs Forhandlinger, 1933-34, pp. 75-81. In Hospitalstidende, 1934, Dec. 4.

In conducting examinations in anatomy, the author has taken occasion to notice peculiarities in the students. At the beginning of the period, the pupils were invariably dilated. The dilatation gradually diminished, and at the end of the period the pupils were of ordinary size. The cheeks as well as other areas of the face and neck were often flushed. A number of sketches were made localizing such areas schematically. Combining these sketches into a composite form, the so-called vasolabile areas corresponded very well in the reverse with the vegetative zones of the face as outlined by Wernoe. D. L. Tilderquist.

Ehlers, Holger. **Two cases of angiectasia of the iris.** Det oftalmologiske Selskab i Köbenhavn's Forhandlinger, 1933, pp. 33-35. In Hospitalstidende, 1934, Nov. 20.

Blood vessels were accidentally found in two cases in which there had been no inflammatory condition before the examination, nor did any follow. A man of fifty-nine years appeared on account of the presence in the right eye of a fragment of copper which could not be removed. At one examination an enlarged vessel was discovered at the periphery of the iris at about the two o'clock position, slanting to the temporal edge of the pupil and then back to the periphery at about the five o'clock position. No complications appeared subsequently. A woman of fifty-four years came for treatment on account of senile cataract, and in her left iris was found a vessel with an almost identical course. The cataract was removed and she made an uneventful recovery. The vessel was not disturbed by the operation. In a third case, in which there had been an iridocyclitis, a similarly placed vessel was found in the left iris. It is thus possible to find in the iris visible vessels which are not due to pathology.

D. L. Tilderquist.

Fledelius, Mogens. **Ophthalmoplegia externa congenita—pupillary reaction for near vision.** Hospitalstidende, 1934, v. 77, Aug. 21, pp. 910-916.

A boy of twelve years presented total external ophthalmoplegia of the left eye, less complete external ophthalmoplegia of the right eye, left-sided ptosis, nystagmus, and epicanthus. The vision of the left eye is normal but that of the right much reduced. The pupillary reaction to light is normal and accommodation is present. In near vision, when the left eye fixes alone, there is no contraction of the pupil, but when binocular vision is undertaken the pupillary reaction appears at once. This tends to show that contraction of the pupil in near vision is more closely connected with convergence than with accommodation.

D. L. Tilderquist.

Franta, J., and Gosman, B. **Polarographic picture of albuminoids in intraocular fluids.** Ceskoslovenska Ofthalmologie, 1933, v. 1, no. 4, pp. 175-182.

By means of the polarographic method of Heyrovsky, investigation was made of the proteins in the aqueous and vitreous of rabbit and pig eyes. The amount of protein in the aqueous and vitreous of pig eyes was found to have a comparatively constant height of "wave." Therefore this method proved a constant amount of protein in these eye fluids. In rabbit eyes a marked fluctuation of the height of the "wave" was found at the first puncture. The height of the wave at the second puncture was considerably higher, a fact which corresponds with the well known experience of increased protein content at second punctures. Also at the second puncture the values for the height of the waves were quite inconstant.

The relationship between albumin and globulin was similar to that in blood serum; and in the eye fluids the amount of globulin does not exceed the amount of albumin. In establishing the absorption capacity (through suppression of the oxygen maximum) of the eye fluids and the blood serum, the values show that the albumins present in the eye fluids possess a higher surface activity than those in the serum. The surface activity of the proteins of the aqueous humor appears to be sixteen times, and that of the vitreous humor ten times greater than that of the proteins in the blood serum.

The results given in this preliminary report do not correspond with previous opinions of changes in the eye fluids. It is assumed that these different properties of the proteins in the intraocular fluids develop while the proteins of the blood serum are passing through the capillary walls of the uveal tract.

G. D. Theobald.

Friedenwald, J. S., and Pierce, H. F. **The respiratory function of the aqueous.** Trans. Amer. Ophth. Soc., 1933, v. 31, pp. 143-156.

The authors refer back to the previous paper in which they described an irreciprocal behavior of the ciliary body as to permeability to water. (When the intraocular tension is lowered, fluid pours out of the ciliary body into the posterior chamber very easily, but when the intraocular pressure is raised it is impossible to demonstrate resorption of fluid from the posterior chamber.) Further experiments are described. Since the irreciprocity of the barrier was destroyed by sodium cyanide poisoning, it is argued that the irreprocity is maintained by virtue of the difference between the oxidation reduction potentials of the ciliary epithelium and of the ciliary stroma. This supports the belief that the aqueous is a secretion, and evidence is presented to show that the ciliary body secretes oxygen into the interior of the eye.

W. H. Crisp.

Herrenschwand, F. **Metaplastic bone formation in the eye.** Zeit. f. Augenh., 1934, v. 84, Nov., p. 265.

Metaplastic bone formation seems to take place chiefly in eyes in which there has been plastic inflammation in the choroid and particularly when there has been shrinkage of the globe. The author implanted into the anterior chamber of the eyes of twenty guinea pigs bits of diseased skin. In twelve of them a plastic inflammation was followed by bone formation in the anterior chamber. He surmises that the stimuli responsible for metaplastic bone formation must be similar to those that induce the development of normal bone. Rous believes these factors to be pressure, traction, and shearing of cell groups. These conditions are probably produced by contraction of a cicatricial membrane within the eyeball.

F. Herbert Haessler.

Korber, H. **The technique of blood injection into the anterior chamber.** Zeit. f. Augenh., 1934, v. 84, Nov., p. 312.

To avoid injuring the lens, the author uses a needle whose end is closed and sharp, and whose opening is on the side. He introduces the needle like a Graefe knife, making a counter puncture before manipulating the syringe.

F. Herbert Haessler.

Krasnov, M. **Treatment of tuberculous iridocyclitis by injection of the patient's blood into the anterior chamber.** (Schieck method.) Sovietskii Viestnik Opht., 1934, v. 5, pt. 6, p. 522.

In three cases this form of therapy had a favorable effect on the course of the disease. (Illustrations.)

Ray K. Daily.

Kyrieleis, W. **The technique and therapeutic mechanism of autohemic injections into the anterior chamber in tuberculous iridocyclitis.** Zeit. f. Augenh., 1934, v. 85, Dec., p. 16.

Complications are rare. Even when the chamber is all but filled with blood a rise of tension is transient. Postcorneal deposits are washed away most strikingly, and this produces the increase in visual acuity. Iris tubercles are refractory to treatment. When the general immunity is decreased, the treatment may make the iridocyclitis worse because it

produces hyperemia and therefore increases the chances of hematogenous infection of the iris. For this reason, the author excludes from treatment patients with fresh iris tubercles.

F. Herbert Haessler.

Markiewicz, S., and Rittler, E. **Two cases of spontaneous cyst of the iris.** Klinika Oczna, 1934, v. 12, pt. 3, p. 511.

According to the classification of Villard and Dejean one cyst belonged to the group formed by separation of the epithelium on the posterior surface of the iris, and the other to the group of wandering cysts. (Illustrations.)

Ray K. Daily.

Mazal, Vladimir. **A case of hereditary eye anomaly, with acute unilateral hypotony.** Ceskoslovenska Ofthalmologie, 1933, v. 1, no. 4, pp. 185-191.

The author reports three cases of aniridia in one family. The mother and the sixteen-year-old daughter who developed acute hypotension and loss of vision in one eye had bilateral ptosis of the lids, aniridia, and lens changes. The thirteen-year-old son had bilateral ptosis, partial coloboma of the iris, and lens changes. All three were myopic and had marked nystagmus. Various theories are discussed. The defects may be due to deficient development of either ectoderm or mesoderm.

G. D. Theobald.

Nordstedt, A. **Recurring dacryoadenitis and iridocyclitis in a patient with pernicious anemia.** Det oftalmologiske Selskab i Köbenhavn's Forhandlinger, 1933, pp. 31-32. In Hospitalstidende, 1934, Nov. 20. (See Section 14, Eyelids and lacrimal apparatus.)

Sitzimkopfova, Helena. **Cholesterin crystals in the anterior chamber.** Ceskoslovenska Ofthalmologie, 1933, v. 1, no. 4, pp. 191-195.

A female aged fifty-three years developed cholesterin crystals in the anterior chamber of the left eye, which had been blind for ten years, following an attack of absolute glaucoma. The bulb was soft, lens opaque, yellowish in color, and subluxated. Blood cholesterin was within the high normal limit.

G. D. Theobald.

8. GLAUCOMA AND OCULAR TENSION

Belsky, A. **A rare case of congenital hydrophthalmos.** Sovietskii Viestnik Opht., 1934, v. 5, pt. 6, p. 579.

A child aged two years with advanced bilateral hydrophthalmos presented the unusual phenomenon of spontaneous transitory subluxation of the lens into the anterior chamber. No relation between the child's habits of living and these occurrences could be determined, nor could the phenomenon be induced by violent movements of the child or by pressure on the eyeball. The author assumes that an intimate connection between the posterior lens capsule and the hyaloid membrane accounts for the lens always returning to its position after being dislocated by increased pressure from behind.

Ray K. Daily.

Martin, J. E. **Double congestive glaucoma and the response to diathermy.** Brit. Jour. Ophth., 1935, v. 19, Jan., p. 48.

This patient aged sixty-three years afforded a comparative study of the reduction of increased intraocular tension. The right eye registered Schiötz 63 mm. Hg at noon. One percent eserin was used hourly and by nine p.m. tension equaled 83 mm. Hg. Diathermy was then applied for five minutes and eserin used every four hours. By 10 a.m. the following day tension was 30 mm. Hg. Within two days it was 27 mm. Hg. The left eye registered Schiötz 115 mm. Hg. Diathermy 400 ma. was applied for five minutes and one instillation of one percent eserin used at noon. By 5:30 p.m. the tension was 15 mm. Within two days the tension was 18 mm. Hg.

D. F. Harbridge.

Pillat, A. **Postoperative retinal detachment in cyclodialysis.** Zeit. f. Augenh., 1934, v. 85, Dec., p. 5.

Retinal detachment must be a very rare complication of cyclodialysis. In the author's patient, great hypotony

with papilledema was followed by stationary retinal detachment which caused no loss of visual acuity, and an inconsequential peripheral defect in the visual field. The author ascribes the lesion to injury with the spatula.

F. Herbert Haessler.

Sapir, I. **Effect of tenotomy of the recti muscles on intraocular tension.** Sovietskii Viestnik Opht., 1934, v. 5, pt. 4, p. 382.

The author tried tenotomy of the four recti in twenty-four glaucomatous eyes. The brief case histories showed satisfactory immediate results as to tension and vision. The period of observation was too brief to permit conclusions as to permanent results. The fall in tension is due to the diminished blood supply to the ciliary body resulting from section of the anterior ciliary arteries running in the recti muscles. Undesirable features of the operation are hemorrhage and sometimes diplopia. The latter is avoided by making the tenotomies incomplete, leaving attached a narrow band 1 mm. wide at each edge of the tendon.

Ray K. Daily.

Uribe Troncoso, M., and Reese, A. B. **Gonioscopic findings after Elliot operation.** Amer. Jour. Ophth., 1935, v. 18, Feb., pp. 103-119.

Wieczorek, A. **The effect of Heine's cyclodialysis on the ciliary body.** Klinika Oczna, 1934, v. 12, pt. 3, p. 482.

The author performed thirteen operations on rabbit eyes, operating on one eye and using the other as a control. On three of the control eyes he did posterior sclerotomy. In one group the cyclodialysis was done by the usual technique, and in the other it was confined to separating the sclera from the ciliary body, without making a communication between the anterior chamber and the suprachoroidal space. The eyes were under observation from seventeen days to thirteen months. In both groups the tonometric measurements showed marked lowering of tension, depending primarily on the extent of the cyclodialysis. Holding the tonometer on the cornea caused a rapid fall in tension, maximal hypotony developing within two to three minutes and lasting for several hours. This phenomenon was absent after posterior sclerotomy, and the tension in those eyes was higher. India ink was introduced into the anterior chambers of three eyes, in one eye nine days after Heine's operation, and in two eyes fifteen days after separating the sclera from the ciliary body. Subsequent examinations and microscopic section showed the India ink in the iris and ciliary body but not in the suprachoroidal space. The author concludes that the reduction of tension is due to separation of the sclera from the ciliary body. Finally the author reports the case of a man of fifty-six years on whose right eye cyclodialysis was limited to separation of the sclera from the ciliary body. During the five postoperative weeks tension remained normal without pilocarpin, and vision improved to five-sixths.

Ray K. Daily.

9. CRYSTALLINE LENS

Bogoroditsky, H. **What accounts for the chromatopsia seen sometimes after cataract extraction?** Sovietskii Viestnik Opht., 1934, v. 5, pt. 6, p. 576.

A review of the literature on the subject.

Klauber, E. **Conjunctival flap in cataract extraction.** Ceskoslovenska Ofthalmologie, 1933, v. 1, no. 4, pp. 200-204.

In order that the conjunctival flap may sufficiently protect the corneoscleral wound from mechanical or infectious complications, it must have the following conditions: (a) undisturbed blood supply ,(b) width and cut parallel to cornea, (c) continuity with the cornea. The flap, says Klauber, is best made with scissors as for Elliot's trephine operation. The flap made at the time of operation with the Graefe knife is too narrow at the sides, and the blood supply is not adequate.

G. D. Theobald.

Moreu, A. **Electrocoagulation of the lens.** Arch. de Oft. Hisp.-Amer., 1934, v. 34, Oct., pp. 527-536. The author used the electrodiaphake of Lacarrère and found that it was a safe and reliable

method for removal of cataracts in capsule. He found the intensity of current advocated by Lacarrère insufficient for the average case, and he uses a current of 150 ma. in the meter, corresponding to a real intensity of 60 to 80 ma. at the tip of the electrode which is to be applied to the lens. Other modifications introduced by Moreu are: application of counterpressure to the eye while the instrument is applied against the lens; bending of the glass tip of the instrument to facilitate extraction in toto; and replacing the neutral electrode with a tin electrode applied to the arm of the patient. (four illustrations)

Ramon Castroviejo.

Pi, H. T. **Cataract among the Chinese.** Chinese Med. Jour., 1934, v. 48, Sept., pp. 928-947.

This is a résumé of the cataract cases seen at the Peiping Union Medical College, where of 12,111 eye patients only 295, or 2.45 percent had cataract. The percentage of the types of cataract was as follows: senile 26.7, complicated 41.5, traumatic 13.7, diabetic 2, cataract due to tetany 0.31, congenital 9.7, unclassified 4.7 percent. (Tables.)

John C. Long.

Pi, H. T. **Subcapsular cataract in osteomalacia.** Chinese Med. Jour., 1934, v. 48, Sept., pp. 948-964.

Cataract with osteomalacia has not been mentioned in the literature. Some cases have perhaps been attributed to tetany. The author suggests that the classification of cataracts accompanied by tetany be revised as follows: (1) cataract in osteomalacia or adult rickets, (2) cataract in rickets, (3) cataract due to hypoparathyroidia, and so on. Three cases of subcapsular opacity in women with osteomalacia are reported.

John C. Long.

Poyales, F., and Moreno S. **Hyaloscopy.** Arch. de Oft. Hisp.-Amer., 1934, v. 34, Sept., pp. 476-487.

The authors have devised a cross-shaped diaphragm to be used instead of the ordinary slit-diaphragm of the slit-lamp. With this cross-shaped slit, the authors studied 794 patients operated upon for cataract; 418 by a modified Smith method; 106 by the Barraquer method; 112 intracapsular with forceps; and 158 extracapsular. The purpose was to study the shape of the hyaloid membrane in its relation to the visual results after operation. The authors found Barraquer's method to give the highest percentage of ideal hemispheric hyaloids with perfect visual acuity, although it also gave the highest percentage of losses of vitreous. The modified Smith gave the highest percentage of deformities of the hyaloid and a lower percentage of vitreous losses than the Barraquer. With Kalt's forceps the percentage of hyaloid deformity was intermediate between the Barraquer and the Smith, with the highest percentage of ruptured capsules. In some patients vision diminished considerably for several months after a successful operation. The diminution of vision was due to rupture of the hyaloid, as from coughing, or vomiting. Three cases of tertiary cataract were found (opacification of the hyaloid). (Ten illustrations.)

Ramon Castroviejo.

Wright, R. E., and Koman Nayar, K. **Rare type of congenital cataract.** Amer. Jour. Ophth., 1935, v. 18, Feb., p. 158.

10. RETINA AND VITREOUS

Arruga, H. **Difficulties in finding retinal detachments.** Rev. de Ophth. de São Paulo, 1935, v. 3, Jan., pp. 133-137. (See Amer. Jour. Ophth., 1933, v. 16, Oct., p. 937.)

Bender, M. B. **Simultaneous closure of all the central retinal vessels.** Amer. Jour. Ophth., 1935, v. 18, Feb., pp. 148-150.

Booshmich, D. **Localization of fundus changes. Sovietskii** Viestnik Opt., 1934, v. 5, pt. 3, p. 185.

After brief reference to the methods in use, the author describes his own method. It uses two 70 cm. rulers with a centimeter scale. The horizontal ruler is fixed and serves as a fulcrum for the vertical ruler, which is movable verti-

cally and laterally. The patient's head is fixed on a chin rest and the examination, conducted in a dark room, begins with the two rulers at right angles with each other. The eye under examination fixes a light at the zero mark of the horizontal ruler, with the other eye occluded. If the diseased eye is incapable of fixation, the good eye fixes and in the calculation the correction for this deviation must be made. The eye is placed 30 cm. behind the horizontal ruler, the upper border of which bisects the cornea. The examiner, seated directly behind the horizontal ruler, focuses the diseased area with an ophthalmoscope and moves the vertical ruler, so that its upper border catches the light reflected from the ophthalmoscope and the pupil. The position of the vertical line is then recorded and with the aid of the attached tables is calculated in millimeters of distance from the limbus and projected on the sclera.

Ray K. Daily.

Ehlers, Holger. **Case of angioid streaks or pseudoxanthoma elasticum.** Det oftalmologiske Selskab i Köbenhavn's Forhandlinger, 1933, pp. 13-18. In Hospitalstidende, 1934, Nov. 20.

A man of forty-eight years had begun to have trouble with vision five or six years before admittance; first double vision, then tilting of objects, and later a thick fog before the right eye. The reduction of vision appeared later in the left eye as well. Two years before he had a pleurisy with spontaneous pneumothorax. Vision was: right, fingers at 0.5 m.; left, 6/18. The fundus of the right eye showed central areas of choroidal atrophy with prominence of the choroidal vessels, two small hemorrhages, and arranged in a wreath-like manner around the disc about twenty brownish or reddish-gray radiating lines, their arrangement resembling that of the choroidal vessels. On the skin at the sides of the neck and on the chest were found groups of small yellowish spots with peculiar wrinkling of the skin. These changes are dependent on degeneration and absorption of the elastic elements of the skin and the eye-ground changes are probably due to similar changes in the lamina elastica of the choroid.

D. L. Tilderquist.

Frandsen, Helga. **The determination of hemeralopia as a test for mild degrees of vitamin-A deficiency.** Danske medicinske Selskabs Forhandlinger, 1934, pp. 42-48. In Hospitalstidende, 1934, Aug. 7.

Groups of school children were tested for light sense, the method devised by Edmund and Möller being used. On the whole, the readings were low. In a group of twenty-eight children six to eight years of age fourteen were normal, while in a group twelve to fifteen years of age only five were normal. The low tests of the latter were explained on the basis of the greater demands on the organism during the period of rapid development. The readings were found to have a higher average after the summer vacation than at the close of school in May. In a group of thirty boarding-school students nineteen to twenty-two years of age only five had normal readings. After administration of vitamin A and calcium phosphate for one month there were eleven normals out of twenty-three individuals. D. L. Tilderquist.

Imre, Joseph. **Electrolysis for closure of retinal tears.** Zeit. f. Augenh., 1934, v. 84, Nov., p. 303.

Vogt reports the use of electrolysis for closure of retinal tears and Szily congratulates him for recommending the procedure which Szily had previously found useful. Now Imre points out that he himself had reported its successful application four years ago. However, he had used the method only exceptionally because he wanted to await late results, in view of the disagreeable late results of the alkali method. Further he has found in experimental animals that electrolysis needles as well as diathermy needles may cause retinal tears. There are cases of retinal detachment in which nothing short of the actual cautery is effective. Large tears with strands of tissue in the vitreous must be cauterized. The author does not agree with Lindner that the cautery causes these strands.

It destroys their connection with the retina and they retract.

F. Herbert Haessler.

Krilov, T., Levin, I., and Tropishko, F. **Treatment of atrophy of the optic nerve and retinitis pigmentosa.** Sovietskii Viestnik Opht., 1934, v. 5, pt. 3, p. 230. (See Section 11, Optic nerve and toxic amblyopias.)

Lazarev, E. **Localization and measurement of lesions in the fundus.** Sovietskii Viestnik Opht., 1934, v. 5, pt. 3, 161.

This is a description of Imre's and Weve's devices, and a discussion of the mathematical formulae underlying them. (Illustrations.) Ray K. Daily.

Pons Tortella, L. **Diagnosis of occlusion of the central retinal artery.** Arch. de Oft. Hisp.-Amer., 1934, v. 34, Oct., pp. 544-553.

The author has observed three cases of embolism of the central retinal artery which were treated with acetylcholine injections. One improved considerably, the other two developed optic atrophy. Treatment with vasodilators causes vascular spasms to disappear, thus differentiating cases of true embolism from those of embolism accompanied by angiospasm, or those of angiospasm only. The cases of embolism were successfully treated with acetylcholine, and in embolism associated with angiospasm the latter disappeared under the treatment, thus improving the condition. (Four illustrations, bibliography.)

Ramon Castroviejo.

Soudakoff, P. **The recent view on the structure of the vitreous body.** Chinese Med. Jour., 1934, v. 48, Sept., pp. 969-974.

The author sums up the views of various recent observers on the structure of the vitreous. The vitreous is a very unstable gel. Fibrillary structures observed in microscopic, ultramicroscopic, and slitlamp preparations of enucleated eyes are apparently artifacts. The framework seen with the slitlamp in living eyes is probably the result of superimposed micellae. The hyaloid membrane is a simple contraction of the gel. Turgescence of the vitreous may be responsible for some types of glaucoma. The presence of Cloquet's canal as an unwalled area of lesser density is an established fact.

John C. Long.

Soudakoff, P. **Senile disciform degeneration of the macula.** Chinese Med. Jour., 1934, v. 48, Sept., pp. 975-981.

Three cases in different stages of development are recorded. Two were bilateral, while in the other case one fundus was obscured by cataract. A colored fundus drawing is shown, and there is a general discussion of the disease. John C. Long.

Stallard, H. B. **Two cases of retinal detachment presenting certain unusual features after operation by surface diathermy.** Brit. Jour. Ophth., 1935, v. 19, Jan., p. 31.

A boy aged thirteen years had a large detachment of the lower outer three-fifths of the retina including the macula and cutting across the disc. Diathermy applications were made at intervals of 3 mm. over a band of sclera extending from the 4:30 to the 6:30 o'clock positions between 8.5 and 15 mm. behind the limbus. No benefit occurred after seventeen days of rest in bed. Three weeks later there was no reattachment of the retina. Six weeks later the retina was completely replaced. Eight months after the operation vision was 6/24 with a full field. In a woman aged forty-seven years, with the retina detached except for a small quadrant above, a band of diathermy application was carried from the eleven to the nine o'clock position on the sclera. The retina became partly reapplied. Fourteen days later a second diathermy operation was performed. The results were unsatisfactory, and the eye remained very soft. The patient was allowed up after one month. Two months and a half after operation the retina was entirely replaced and after six months vision equaled 6/24. D. F. Harbridge.

Stepka, J. **Unilateral retinitis pigmentosa.** Ceskoslovenska Ofthalmologie, 1933, v. 1, no. 4, pp. 195-200.

A male aged thirty-five years had a history of failing vision in the right eye

since the age of twenty years. The field of vision was concentrically narrowed to 15°. The pupil reacted slowly. The fundus showed the typical picture of retinitis pigmentosa with "bone corpuscle" deposits, and narrowing of vessels even to thread-like arteries. The author found eleven cases reported in the literature. G. D. Theobald.

Tichomirov, P. **Ocular changes in hemorrhagic meningoencephalitis.** Sovietskii Viestnik Ophth., 1934, v. 5, pt. 6, p. 535.

In the course of a case of meningoencephalitis bilateral hemorrhages into the vitreous reduced vision to hand movements and led to retinitis proliferans. Ray K. Daily.

Vogt, A. **The history of catholysis in retinal detachment.** Zeit. f. Augenh., 1934, v. 85, Dec., p. 2.

Vogt is induced by Szily's challenge to review the history of cathode electrolysis in retinal detachment. He gives references to papers in which the subject was first mentioned, and points out that he himself was the first to use cathode electrolysis for this purpose.
F. Herbert Haessler.

Vogt, Alfred. **Cathodal electrolysis as a new method of treating retinal detachment.** Ann. d'Ocul., 1934, v. 171, Oct., pp. 801-804.

The cathodal electrode may be used to seal the retinal tear in detachment. The apparatus used is similar to that employed in electrolysis of cilia. Vogt states that electrolysis is a safer, simpler, and more effective method than the use of the diathermy needle. The sharp needle electrode is thrust through the sclera to the margins of the retinal tear. Gas bubbles make the path of the needle visible with the ophthalmoscope. Numerous punctures may be made at one operation. John C. Long.

11. OPTIC NERVE AND TOXIC AMBLYOPIAS

Chang, S. P. **Acute retrobulbar neuritis in myelitis.** Chinese Med. Jour., 1934, v. 48, Sept., pp. 991-998.

A Chinese man aged thirty years suddenly lost the vision of both eyes without apparent cause. The retinal veins were somewhat dilated and the arteries constricted. Twelve days later there was complete motor and sensory paralysis of all the extremities, with other neurologic findings. Vision gradually improved, leaving central scotomata and contracted fields. Five months after onset there was partial optic atrophy and almost complete motor paralysis and anesthesia of both lower extremities. The literature of opticomyelitis is reviewed. John C. Long.

Chautin, S. **Lowered adaptation as an early symptom of lead poisoning.** Sovietskii Viestnik Ophth., 1934, v. 5, pt. 6, p. 561.

The dark adaptation of forty-four men and forty-two women employed in a printing establishment was measured with the Lazarev adaptometer. The tabulated findings show delayed adaptation at the end phase, more pronounced in women than in men, and more marked in those handling lead, such as typesetters. This disturbance in dark adaptation may be considered as the first symptom of lead poisoning.
Ray K. Daily.

Kagan, I. **Retrobulbar neuritis during pregnancy.** Sovietskii Viestnik Ophth., 1934, v. 5, pt. 5, p. 503.

A woman of twenty-three years, who developed left retrobulbar neuritis in the 4th or 5th week of each of three pregnancies, recovered each time with interruption of pregnancy. After the third attack she was sterilized.
Ray K. Daily.

Krilov, T., Levin, I., and Tropishko, F. **Treatment of atrophy of the optic nerve and retinitis pigmentosa.** Sovietskii Viestnik Opht., 1934, v. 5, pt. 3, p. 230.

Eighteen patients with optic atrophy or retinitis pigmentosa were treated with inhalations of amyl nitrite and retrobulbar injections of atropin. In optic atrophy amyl nitrite inhalations

were entirely ineffective. In three cases of retinitis pigmentosa there was temporary improvement in vision. Atropin produced temporary improvement of vision in atrophy of the optic nerve and retinitis pigmentosa. In order to determine whether the effect of atropin is due to its specific action or merely to the reaction from retrobulbar injection, four cases were treated in one eye with retrobulbar injections of atropin, and in the other eye with retrobulbar injections of 1 percent saline solution. The saline injections are painless, while the injections of atropin are very painful. In two cases the results were the same in both eyes, and in two atropin gave a better result, although vision improved also in the eye treated with saline. Ray K. Daily.

P'an, Chen. **Retrobulbar neuritis among the Chinese.** Chinese Med. Jour., 1934, v. 48, Sept., pp. 999-1004.

There were thirty cases of retrobulbar neuritis among 2000 consecutive eye patients seen during a period of nine months at the Central Hospital, Nanking. Eighty-seven percent of the patients were soldiers. In most cases scotomata were the only ocular findings. General physical examinations were negative except in a few. None gave evidence of multiple sclerosis. P'an suggests that some unknown factor may be responsible.

John C. Long.

Tommasini, A., and Bombelli, U. **Optic neuritis and the posterior sinuses.** Riv. Oto-Neuro-Oft., 1934, v. 11, Sept.-Oct., pp. 494-530.

The authors report eight cases of monocular or binocular edema of the disc in which the vision and visual fields were affected in different degree. Ethmoid-sphenoidectomy gave good results in those patients who presented the ethmoidal and sphenoidal pneumatosis, associated with sinusitis and acute symptoms. The results were poor and transitory in those patients who had hyperplastic sinusitis and whose symptoms were old. (Bibliography, thirty-nine figures.) M. Lombardo.

12. VISUAL TRACTS AND CENTERS

Disertori, B. **Parinaud's syndrome from Wernicke's superior polioencephalitis.** Riv. Oto-Neuro-Oft., 1934., v. 11, Sept.-Oct., pp. 483-493.

A man of forty-three years, a heavy drinker, showed paresis of the left internal rectus with rigid miotic pupils, and paralysis of convergence and of associated vertical movements of the eyeballs. The author attributes these symptoms to hemorrhagic superior polioencephalitis (Wernicke). (Bibliography, two figures.)

M. Lombardo.

Espildora Luque, C. **Ophthalmic Sylvian syndrome.** Arch. de Oft. Hisp. Amer., 1934, v. 34, Nov., pp. 616-621.

The author has observed three cases of blindness in one eye associated with temporary hemiplegia of the opposite side. He explains the production of such a syndrome as due to embolism of the ophthalmic artery, which would originate a reflex spasm of the Sylvian artery of the same side. The embolism of the ophthalmic artery accounts for the permanent amaurosis. The spasm of the Sylvian artery would explain the temporary hemiplegia, which was undoubtedly produced by embolism of the Sylvian artery. (One illustration.)

Ramon Castroviejo.

Goldfeder, A. **Severe posthemorrhagic amblyopia improved by transfusion.** Zeit. f. Augenh., 1934, v. 85, Dec., p. 31. (See Amer. Jour. Ophth., 1935, v. 18, March, p. 287.)

Möller, H. U., and Busch, E. **Ophthalmic symptoms of intracranial tumors.** Hospitalstidende, 1934, v. 77, Nov. 6, pp. 1249-1263.

This article is a part of a work by six collaborators entitled "Contribution to the surgery of intracranial tumors, with a review of Danish material from 1907 to 1931." The work is divided into seven divisions and occupies the whole issue of the journal, more than ninety pages. Möller and Busch review the eye findings in 218 cases of verified intracranial tumor and discuss them on the basis of anatomic and pathologic

considerations. The percentages of common eye findings in the total number of cases were as follows: choked disc 73, visual field defects 13, disturbances of ocular movement 6, pupillary changes 7, primary optic atrophy 2.

D. L. Tilderquist.

Orzechowski, K. **Dalrymple's sign.** Klinika Oczna, 1934, v. 12, pt. 3, p. 438.

A review of the literature shows that retraction of the lids due to an organic lesion is a rare phenomenon. Previous to discussion of the various lesions of the brain which might produce this symptom, the author reports the case of a young man of thirty years, who after a stormy onset with cerebral symptoms developed retraction of the lids, paralysis of upward movement, absence of pupillary reactions, and paralysis of convergence. Convergence and the upward movement of the eyeballs were restored to normal, but retraction of the lids and diminished pupillary reaction to light remained. The author diagnoses the case as hemorrhage on one side of the posterior commissure.

Ray. K. Daily.

13. EYEBALL AND ORBIT

Esteban, M. **Ex-vacuo restoration of the shrunken socket.** Rev. Cubana Oto-Neuro-Oft., 1934, v. 3, July-Oct., p. 94.

The author has obtained very satisfactory results from the Truc ectropion operation for both upper and lower lids. The operation consists in splitting of the lower lid to free the conjunctiva, the use of a suture to maintain extension of the conjunctiva, and to form a cul-de-sac, and counterextension of the lid by means of sutures secured to adhesive plaster in the superciliary region. (Illustrated.) M. Davidson.

Fiszman, T. **Bulboconjunctival recess.** Zeit. f. Augenh., 1934, v. 84, Nov., p. 313.

The congenital anomaly described consisted of a bulboconjunctival pocket secondary to which were convergent strabismus, limitation of movement of globe, and mechanical amblyopia. The caruncle and plica semilunaris were rudimentary. F. Herbert Haessler.

Herschendörfer, A. **The production of an artificial "conjunctival" sac capable of taking a prothesis, by means of a free transplant of superficial skin.** Zeit. f. Augenh., 1934, v. 84, Nov., p. 284.

The author dissects a very thin piece of skin, using only the outermost skin layers, less than ⅓ millimeter thick, from the inner surface of the arm. To attain the desired size and shape, the original outlining skin incision is made about a template. The flap is then wrapped about a glass ball 22 millimeters in diameter and is inserted into the orbit. Sutures are placed through the edge of the graft and that of the lids. The graft always takes.

F. Herbert Haessler.

Ismaïl, Hachem. **Clinical and anatomopathologic study of suppurative phlebitis of the cavernous sinus.** Ann. d'Ocul., 1934, v. 171, Oct., pp. 814-845.

Most cases of suppurative phlebitis of the cavernous sinus are incorrectly termed thrombophlebitis. The author does not deny the possibility of a thrombophlebitis, but he was unable to find in the literature such a case confirmed by autopsy, nor has he seen such a case. All the cases described have been of suppurative phlebitis. A true thrombophlebitis obstructs the veins and tends more or less to isolate the infection. A suppurative phlebitis does not obliterate the vessel but pours the infection into the general circulation. Eight cases of suppurative phlebitis of the cavernous sinus are reported with autopsy findings. There is a detailed discussion of the pathologic anatomy and physiology. John C. Long.

Ling, W. P. **Ocular neoplasms among the Chinese.** Part 2. Chinese Med. Jour., 1934, v. 48, Sept., pp. 982-986.

Two Chinese men, aged thirty-one and thirty-two years, presenting marked unilateral exophthalmos and keratitis e lagophthalmo, were treated by exenteration of the orbit. In each case a histologic diagnosis of cavernous hemiangioma of the orbit was made. No recurrences were observed. This

type of tumor is not malignant and can well be treated through the Kroenlein approach. In the two cases observed the eyes had already been destroyed by exophthalmos and keratitis, so exenteration was done. John C. Long.

O'Connor, G. B., and Pierce, G. W. **Eye-socket reconstruction necessitated by extraocular myositis associated with thyroid disease.** Amer. Jour. Ophth., 1935, v. 18, Jan., pp. 51-53.

Popov, M. **Restoration of the lower conjunctival cul-de-sac.** Sovietskii Viestnik Ophth., 1934, v. 5, pt. 3, p. 215.

After freeing the conjunctiva and enlarging the cul-de-sac by two vertical inisions at the angles of the lids, the author lines the poket thus formed with skin taken from the shoulder. An artificial eyeball with the cornea toward the orbit is introduced to immobilize the sutured transplant.

Ray K. Daily.

14. EYELIDS AND LACRIMAL APPARATUS

Abramovicz, I. **Vioform in the treatment of inflammatory conditions of the lid border.** Klinika Oczna, 1934, v. 12, pt. 3, p. 507.

Vioform is an odorless dehydrating powder, which the author recommends for ulcerative blepharitis and eczematous conditions of the lid.

Ray K. Daily.

Abramovicz, I., and Wasowski, T. **The relation of permeability of the lacrimal passages to pathologic conditions in the nose.** Klinika Oczna, 1934, v. 12, pt. 3, p. 495.

In 146 cases the lacrimal passages were irrigated with Elschnig's syringe. Of 95 cases with diminished permeability, 80 had pathologic conditions in the nose. Of 55 cases with normal permeability, 41 had no nasal pathology.

Ray K. Daily.

Agnello, F. **The Marcus Gunn phenomenon.** Riv. Oto-Neuro-Oft., 1934, v. 11, Sept.-Oct., pp. 531-544.

A boy of thirteen years showed the Marcus Gunn syndrome, opening of the mouth being followed by quick elevation of the right upper lid, and movements of the lid being rhythmic and synchronous with movements of the jaws in mastication. On looking downward with open mouth, dissociation between the bulbar and lid movements manifested itself, resulting in Graefe's symptom. The author thinks the phenomenon due to a connection through the motor root of the fifth nerve. (Bibliography, three figures.)

M. Lombardo.

Bastan, N. **Affections of the lacrimal passages.** Ann. d'Ocul., 1934, v. 171, Oct., pp. 846-863.

The operation of stricturotomy as devised by Poulard is applicable to most cases of stenosis of the lacrimal passages. Under local anesthesia the canaliculus is partially slit, the stricture is located by probing, and a knife is introduced into the lacrimal canal. The stricture is cut by rotating the knife through forty-five degrees. This is followed by passage of sound no. 10, 11, or even 14, which is not difficult after incision. The sounding is repeated weekly for from four to six weeks. About ninety-five percent of the cases of lacrimal obstruction so treated are cured. In case of failure dacryocystorhinostomy or dacryocystectomy may be performed. John C. Long.

Doodinov, O. **Inflammatory processes of the lacrimal canaliculi.** Sovietskii Viestnik Opht., 1934, v. 5, pt. 3, p. 206.

The author reports twelve cases of dacryocanaliculitis, and points out that the most frequent forms show no appreciable hypertrophy of the punctum, and are characterized clinically by the appearance of mucopurulent secretion on pressure over the canaliculi. Dacryocanaliculitis is very frequent in severe cases of trachoma, and its diagnosis and eradication are very important for the safeguarding of intraocular operations. The treatment is complete excision under local anesthesia, with the guidance of a probe introduced into the canaliculus. (Illustrations.)

Ray K. Daily.

Fiszman, T. **Whistling with the tear ducts.** Zeit. f Augenh., 1934, v. 85, Dec., p. 27.

In an occasional person, the structure and state of relaxation of the tear sac is such that air can be forced into it. When the pressure is increased, the air may leave through the tear ducts with a whistling sound. The author describes in detail a patient who exhibits this phenomenon.

F. Herbert Haessler.

Jakovleva, A. **An attempt at general immunization in blepharitis and eczema of the lids.** Sovietskii Viestnik Opht., 1934, v. 5, pt. 3, p. 234.

The use of autogenous vaccines gives favorable results in blepharoconjunctivitis not amenable to local therapy. The vaccine should be prepared from the skin and conjunctival flora. Better results are obtained by injections at short intervals. Recurrences are rare, and are usually due to an infection with a new microorganism. In abscesses and phlegmons of the lids stock vaccines are equally effective. Ray K. Daily.

Manezo, J. M. **Transitory bilateral blepharoptosis.** Rev. Cubana Oto-Neuro-Oft., 1934, v. 3, March-June, p. 63.

The condition cleared up spontaneously in twelve days and was considered as either a post-grippal complication or due to a mild encephalitis complicating small-pox and antityphoid vaccinations. M. Davidson.

Marquez, M. **An atypical case of Mikulicz's syndrome.** Arch. de Oft. Hisp.-Amer., 1934, v. 34, Oct., pp. 513-526. (See Amer. Jour. Ophth., 1934, v. 17, Dec., p. 1192.)

Nordstedt, A. **Recurring dacryoadenitis and iridocyclitis in a patient with pernicious anemia.** Det oftalmologiske Selskab i Köbenhavn's Forhandlinger, 1933, pp. 31-32. In Hospitalstidende, 1934, Nov. 20.

A patient, later found to be suffering from pernicious anemia, appeared with well developed iridocyclitis and ulcerative keratitis in one eye. Recovery was followed by an attack in the other eye, complicated by dacryoadenitis. A third attack resembled the second and involved both eyes. It is believed that the pernicious anemia had nothing to do with the disease of the eye, but that the latter was akin to a group of disorders which includes Mikulicz's disease and uveoparotid fever.

D. L. Tilderquist.

Sédan, J., and Coulomb, P. **A case of nasoorbital meningocele.** Ann. d'Ocul., 1934, v. 171, Oct., pp. 804-808.

A man aged twenty years was seen because of a swelling of the upper lid resembling a medium-sized chalazion. On turning the lid a mass was seen extending above and behind the globe. X-ray examination revealed a large cyst involving the orbit and ethmoid cells and extending into the cranium. A diagnosis of nasoorbital meningocele was made. Therapy was not attempted. X-ray pictures are reproduced.

John C. Long.

Sprindrich, J., and Wagner, R. **X-ray treatment of chronic blepharitis.** Ceskoslovenska Ofthalmologie, 1933, v. 1, no. 4, pp. 212-214.

X-ray therapy in erythema doses was used in four cases of ulcerative blepharitis, seven cases of eczematous blepharitis, and five of Elschnig's blepharoconjunctivitis. A temporary hyperemia followed, resulting in cure in one-half of the cases. No case became worse as a result of the treatment. A lead prothesis protected the eyeball.

G. D. Theobald.

15. TUMORS

Krotkov, H., Golubera, K., and Fioletov, S. **Recklinghausen's disease in ophthalmology.** Sovietskii Viestnik Opht., 1934, v. 5, pt. 3, p. 248.

The difficulty of diagnosis is demonstrated by reporting two cases diagnosed clinically as fibromatosis of the lids and proved histologically to be neurofibroma, and one case of nevus at the limbus diagnosed clinically as neurofibroma. (Photomicrographs.)

Ray K. Daily.

Mier, L. **A case of rhabdomyoma of the orbit.** Arch. de Oft. Hisp.-Amer., 1934, v. 34, Oct., pp. 537-543.

This is an anatomicopathological study of a case of rhabdomyoma of the orbit, beautifully illustrated with microphotographs, showing the myocytes stained by the silver carbonate method of Rio Ortega. (Four photomicrographs.) Ramon Castroviejo.

P'an, T. H. **A case of "epibulbar melanoma."** Chinese Med. Jour., 1934, v. 48, Sept., pp. 987-990.

A Chinese man of sixty-three years was seen one year after first noticing a small nodule at the limbus. A dark-colored tumor covered the lower portion of the cornea and the entire pupillary area. The eye was enucleated. Pathologic examination revealed a melanoma covering the cornea and extending through the sclera to involve the choroid as far back as the papilla. The site of origin could not be determined. Three months after enucleation abdominal metastases were evident.

John C. Long.

16. INJURIES

Alexseeva, B. **A case of marked pigmentation of the bulbar conjunctiva** following subconjunctival scleral rupture **with complete aniridia.** Sovietskii Viestnik Opht., 1934, v. 5, pt. 6, p. 540.

The author adds her own case to fifteen which she collected from the literature. The patient was a woman of forty-five years who came with the history of a blow on the left eye a week previously. Examination showed a subconjunctival scleral rupture temporally, complete aniridia, a black swelling on the outer limbus which was probably the iris, a band of normal conjunctiva 2 to 3 mm. wide around the limbus, and the rest of the bulbar conjunctiva pigmented a dark brown. Biopsy of the conjunctiva showed dark pigment, between and within cells resembling chromatophores and having a slightly elongated form and oval nuclei.

Ray K. Daily.

Chautin, S. **Visual adaptation among workers with the arc lamp.** Sovietskii Viestnik Opht., 1934, v. 5, pt. 3, p. 239.

Dark adaptation was measured in forty-two men, nine of whom were working with the acetylene torch, and the rest with the arc lamp. The age of the men was under thirty and the length of employment was from one to four years. It was found that dark adaptation was delayed at the end phase in both groups of workers, as with the delayed adaptation found in chronic lead poisoning. Because the delay manifests itself at the end and not at the beginning, the author attributes the disturbance to reduced sensitivity in the visual cortical centers, caused by general exposure to ultraviolet rays and injurious gases. The delay in adaptation was more pronounced in workers with the acetylene torch than in workers with the arc lamp. It was also more pronounced in workers in closed quarters than in those working outdoors. The findings call for special attention to ventilation for these industries, as well as for limitation of working hours.

Ray K. Daily.

Ershkovich, I **Agricultural traumatism to the eye.** Sovietskii Viestnik Opht., 1934, v. 5, pt. 3, p. 223.

This is a study of ocular injuries on a collective farm comprising a population of thirty-eight thousand. Of all patients in this region 7.6 percent suffered from ocular injuries of which 50 percent occurred during the threshing period, 32 percent during harvesting, and 12 percent during the sowing. Most of the injuries consisted of lodgment of foreign bodies in cornea and conjunctiva, superficial corneal erosions, and corneal infiltrates. Agricultural injuries are more frequent than industrial, but much milder, 95 percent being slight injuries with preservation of good vision. Prophylaxis should consist of education in sanitation, protective spectacles, training for vocational skill, and development of technical machinery to replace manual labor.

Ray K. Daily.

NEWS ITEMS

Edited by Dr. H. Rommel Hildreth, 640 S. Kingshighway, St. Louis

News items should reach the Editor by the twelfth of the month.

Deaths

Dr. Harold Jolly Beard, Youngstown, Ohio, aged 54 years, died January 30, 1935, of cerebral hemorrhage.

Dr. Anthony J. Giordano, New York City, aged 37 years, died January 23, 1935, of pneumonia.

Dr. Lewis E. Maire, Grosse Pointe, Mich., aged 79 years, died January 9, 1935, of carcinoma of the prostate.

Dr. Kate Wylie Baldwin, Philadelphia, died January 18, 1935.

Miscellaneous

American Board of Ophthalmology: Examinations, Philadelphia, June 8, New York City, June 10. Applications must be filed before April 10. Secretary, Dr. Wm. H. Wilder, 122 South Michigan Ave., Chicago, Ill.

The library of Prof. Dr. Anton Elschnig, recently retired, is being offered for sale. The collection comprises works in the original languages of the greatest ophthalmologists of America, England, France, Germany, Italy, Netherlands, Russia, Spain, as well as those of China and Japan written in German. The library has an accurately numbered card index arranged both according to the names of authors and to the titles of works.

A catalogue may be obtained from Dr. Ernst A. David-Labor, iv., Brahmsplatz 4, Vienna.

The University of Michigan, Department of Postgraduate Medicine, and the Michigan State Medical Society announce the fifth annual postgraduate course in ophthalmology and otolaryngology, University Hospital, Ann Arbor, Michigan, April 22-27, 1935.

The Faculty of Medicine of Paris announces that the Ophthalmic Clinic of l'Hôtel-Dieu will give a course in ophthalmology beginning Friday, May 17 to June 17, 1935. Prof. F. Terrien will be aided by Profs. Rathery, Regaud, Strohl, Tiffeneau, Velter, Zimmern, Ramadier, Renard, and Drs. Cousin, Veil, Blum, Dollfus, Hudelo, Braun, Goulfier. The course will cover the medical and surgical aspects of ophthalmology.

The Managers of the New York Institute for the Education of the Blind announce with sincere regret the resignation of Principal Edward M. Van Cleve after twenty-one years of devoted and inspiring leadership and his election as Principal Emeritus.

The Managers announce the election of Dr. Merle Elbert Frampton as Principal of the New York Institute for the Education of the Blind.

Societies

The following program of the Scientific Meeting of the Eye Section of the Philadelphia County Medical Society was given on March 7, 1935: Dr. Robert H. Rohm, Case of intraocular foreign body; Dr. Alvin Howland, Case of intraocular foreign body; Dr. George H. Cross, The removal of nonmagnetic intraocular foreign bodies; Dr. Willis F. Manges, Roentgen-ray and fluoroscopic co-operation in the removal of nonmagnetic intraocular foreign bodies; Dr. Frank C. Parker, The removal of magnetic intraocular foreign bodies.

The Tsinan Ophthalmological Society was organized in January, 1935, and its first meeting was held at Cheeloo University School of Medicine on January 30. There was a large attendance. Dr. Eugene Chan, head of the Department of Ophthalmology at Cheeloo, was the Chairman. Dr. Chan was formerly a member of the staff of the Wilmer Ophthalmological Institute of Baltimore, Maryland, U.S.A.

The International Organization of the Campaign Against Trachoma will meet on April 3, 1935, at London. Prof. Dr. Emile de Grosz is president and the general secretary is Dr. F. Wibaut, P. C. Hooftstr, 146, Amsterdam. The program will be opened by the president Prof. Dr. E. de Grosz. Papers will be given by Drs. A. F. McCallan, Josephus Jitta, Tewfik (Egypt), Myashita (Japan), and Zachert (Poland).

In conjunction with the meeting of the Ophthalmological Society of the United Kingdom, London, April 4, 5, and 6, there will be a meeting of the International Association for the Prevention of Blindness, under the presidency of Professor de Lapersonne. Dr. Park Lewis of Buffalo expects to attend the London meetings.

Personals

On December 15, the eightieth birthday of Professor Tscherning was celebrated at Copenhagen by his colleagues, friends, and pupils.

Dr. R. S. Grimmett announces the opening of offices in the Medical Building, Ashtabula, Ohio, with practice limited to eye, ear, nose and throat.

Dr. William C. Bane and Dr. William M. Bane are limiting their practice to ophthalmology and have discontinued the practice of otolaryngology.

Dr. James W. Smith has recently been appointed Consulting Ophthalmologist to the Nyack Hospital, Nyack, N.Y., and Associate Attending Ophthalmologist at the Hospital for Joint Diseases, New York City.

You and Your Patient

Your patient and his family are exposed daily to advice on eye care and eye hygiene, through the radio, newspaper, and often, through plain neighborly gossip. Sometimes the advice is sound; sometimes it is quackery. When he is in your waiting room, will he find information about the eyes?

Eyes in Childhood
Eye Accidents in Child Play
Facts and Fallacies Concerning Squint
Lighting the Home for Health and Happiness
Concerning Senile Cataract
Home Treatment of the Eyes
Eyes and Athletics
Contact Glasses

In our program of co-operation with ophthalmologists, we invite members of the profession to send for a complimentary set of our popular pamphlets on eye hygiene, listed above.

National Society for the Prevention of Blindness, Inc.
50 West 50th Street, New York, N. Y.